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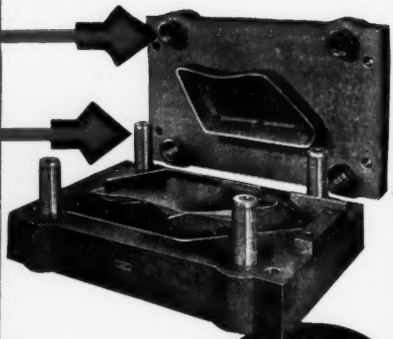

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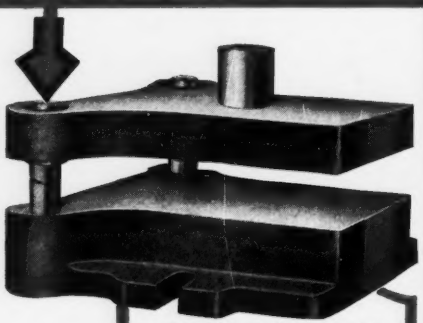

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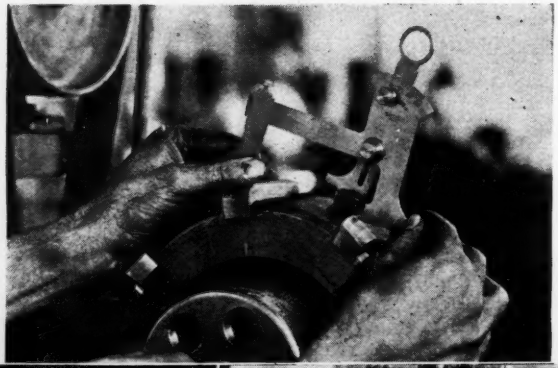

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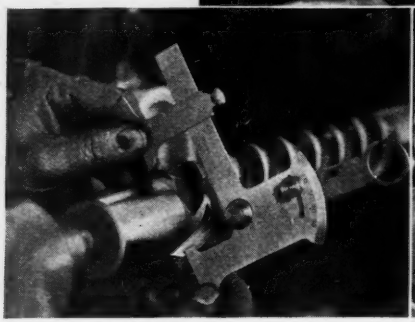

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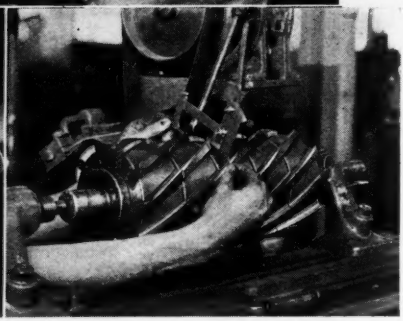

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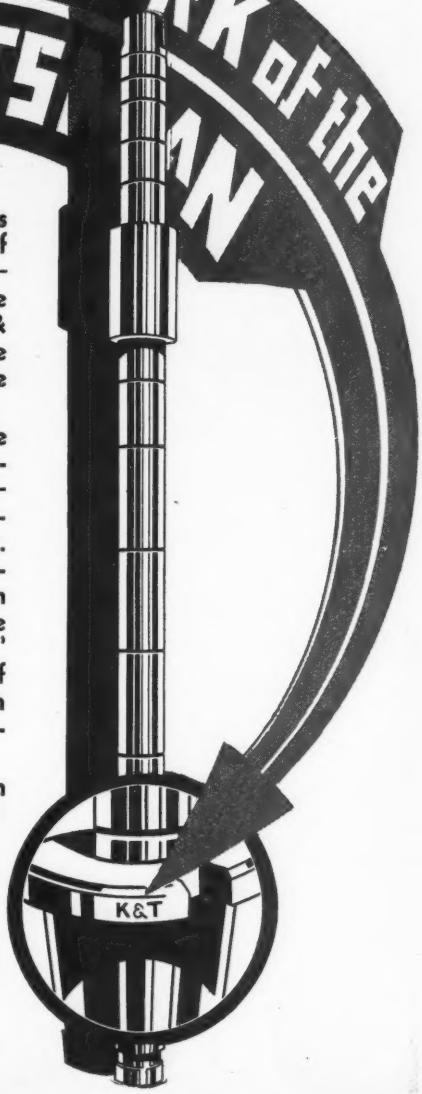

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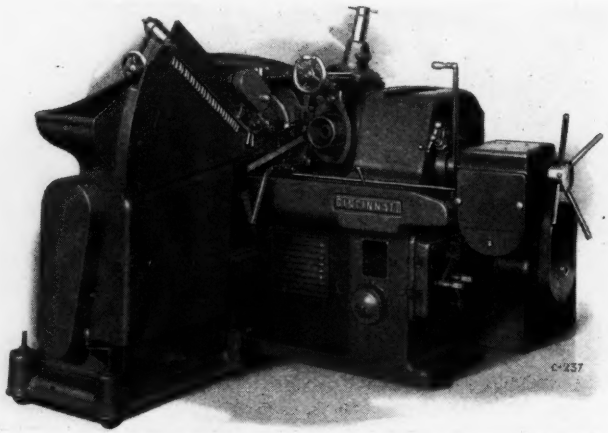

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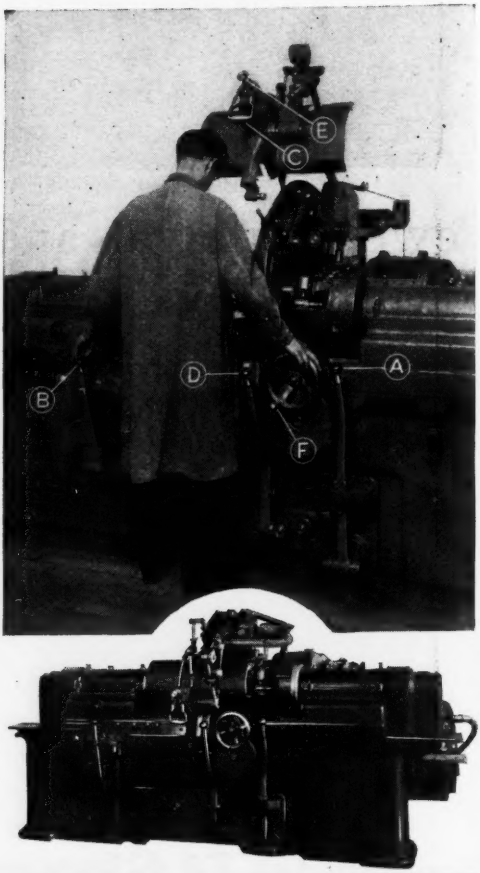

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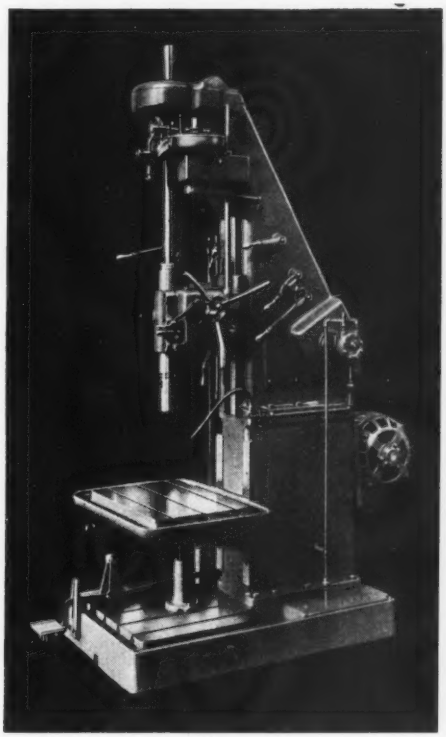

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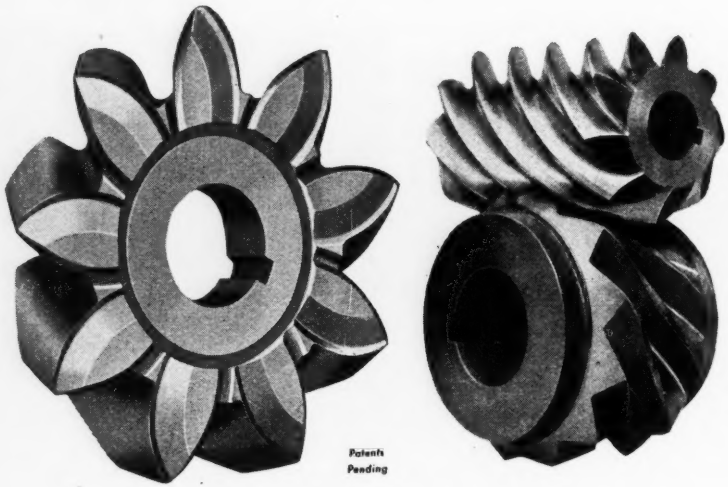

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A Magazine for Machine Shop Executives
HOWARD CAMPBELL, Editor

Vol. 3 AUGUST, 1930 No. 3

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MODERN Machine Shop

AUGUST, 1930

CINCINNATI, OHIO VOL. 3, NO. 3

The Hone As a Railway Shop Tool

By DONALD A. CLARK

THE use of the hone for finishing round holes which serve as bearings or as the aligning walls for moving parts of locomotives is a comparatively recent departure in railway shop practice and is, accordingly, attracting a considerable amount of interest. Those who have given the hone a trial have, however, adopted it as a part of the regular equipment, and from all reports the hone as a production tool is coming up to expectations.

The honing machine is not expected, either by the users or by the manufacturers, to replace the boring tool and reamer, but rather is intended to start where these tools leave off. The particular function of the hone is to give the work a finish that cannot be obtained by the use of the cutting tool. To what extent the finish of a hole that has been finished with the ordinary tool is straight and true depends more or less upon whether the metal in the hole is of uniform hardness, whether or not the stock was of even thickness, and so on.

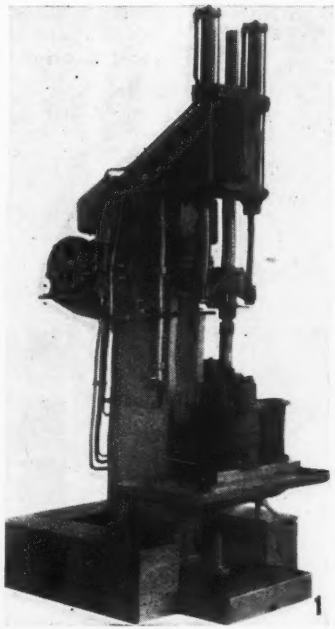
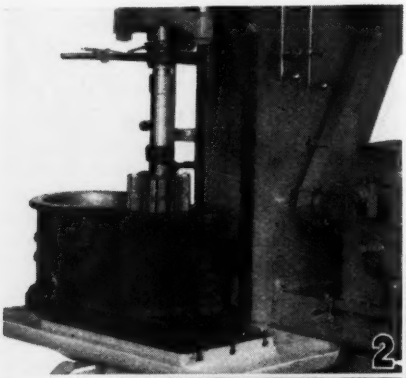


Fig. 1—Barnes vertical honing machine set up to hone the core in the air compressor section of a cross compound locomotive cylinder.

High spots or hard spots in the surface of a hole may not be apparent to the eye, but a bearing surface that is uneven will most certainly wear faster than a surface that is absolutely smooth and uniform. Not only does the hone produce a smooth and uniform surface, but it will also remove chatter marks—which are so hard to eliminate—and will quickly erase the "fuzz" that is left after a boring or reaming operation. On large work, such as locomotive steam cylinders, air brake cyl-

inders, bushing retainers, and so on, the hole is bored or reamed to from .005 to .008 in. undersize, after which it is honed to within .001 in. of drawing size, which is within the usual tolerances. The long honing stones pass over port holes and recesses in a straight line, maintaining perfect alignment to the edge of the hole and producing a perfect bearing. The finer the finish, the closer the possible limits. And the constantly-increasing quality of the workmanship in locomotive shops and other shops in which the work is of the heavier class is as constantly calling for closer limits and better finish.

The smaller locomotive parts can be honed with a hone held in the spindle of an ordinary drill press or other similar machine, but work of the larger class can best be handled with a machine that is especially designed for this purpose, such as honing machine shown in Fig. 1. This machine is a Barnes vertical honing machine with hydraulically reciprocating spindle, set up to hone the bore in the air compressor section of a cross compound railroad locomotive cylinder. The bore is 14½ in. diameter by 14 in. long. The machine is 12 ft. high, with a table 18 x 28 in. Two parallels are used to support the work, so that the hone can clear the hole at the bottom on the down-stroke in the same manner that it clears at the top on the upstroke. A certain amount of "overrun" is necessary in order to keep the ends of the bore parallel with the central portion and thus prevent "bell-



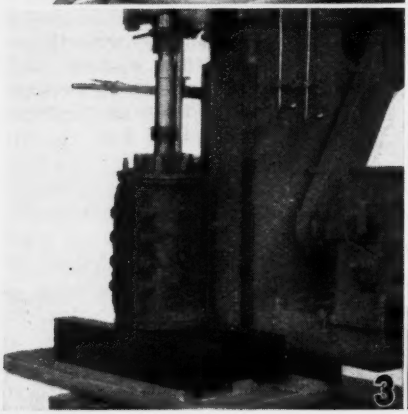
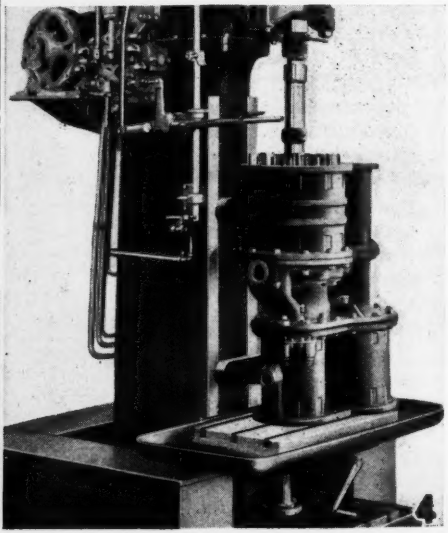


Fig. 2—Honing high compression steam cylinder of cross compound unit. Fig. 3—Honing power reverse cylinder. Fig. 4—Honing cross compound unit after assembling.



mouth." A Hutto six-stone hone is used, set to operate at a speed of 35 cycles of reciprocations per minute. The number of reciprocations is governed by an Oilgear pump, and can be set for from 20 to 50, depending upon the size of the bore. At the same time the spindle is revolving at a speed of 89 r.p.m. The speed of the spindle can also be regulated according to the size

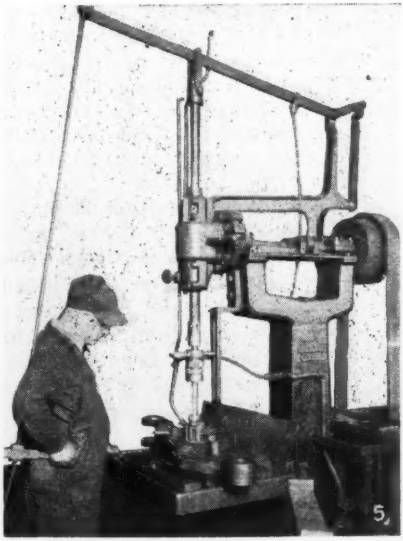


Fig. 5—Honing hardened steel bushing in connecting rod for Baker valve gear, using Hutto hone and converted drill press.

of the hole, speeds of 32, 45, 63, 89, 128, 180, 250, 354, and 400 r.p.m. being possible. Approximately .006 in. of stock was left in this bore to be honed out, the operation being finished in 10 minutes. The high compression steam cylinder of the cross compound unit is honed by setting up the work in the same manner, as shown in Fig. 2. The only adjustment required is the necessary changing of the honebody to obtain the correct size, and adjustment of the quick-change speed gears.

In Fig. 3 the same type of machine is shown set up to hone a power reverse locomotive cylinder, 10 in. diameter by 22 in. long. From .005 to .007 in. of stock is left in the bore of this piece for honing, and the spindle is set to reciprocate (complete cycles) 25 times per minute, while revolving at a speed of 128 r.p.m. The illustration Fig. 4 shows the honing operation applied to a cross compound unit after assembling.

It has been common practice in the past to bush the smaller holes in locomotive parts with hardened steel bushings, and then make the pins and shafts to fit the holes. In former years these holes were polished or lapped to obtain a smooth finish, but the development of the grinding machine and the hone have made it possible to machine bushings to fit the pins. In the shop in which the illustrations shown here were obtained, the hone is used exclusively for finishing small holes.

In the absence of a machine built especially for honing, a drill press, shown in Fig. 5, has been adapted for this purpose. The upper end of the spindle has been connected, by means of a toggle joint, to a bar over the top of the machine, a rod being attached so that the spindle can be moved up and down. The lower end of the rod is pinned to a hand lever which is hinged to a post so that the operator can reciprocate the spindle while at the same time watching the work. The honing equipment includes a complete set of Hutto "six-stone" hones, the sizes varying by eighths of an inch from 1½ in. to 2½ inches. Each hone is adjustable $\frac{1}{16}$ in. in either direction from standard, or a total of ⅛ inch. One of the advantages of the hone lies in the fact that the hone and work do not require careful aligning with each other. The hone is self-aligning, and as long as the work is in reasonably close alignment with the hone, the hone can

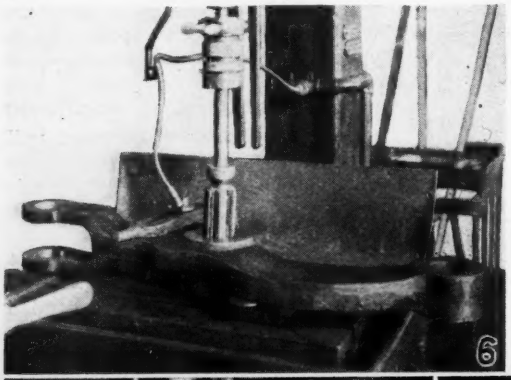
be used to locate the work properly.

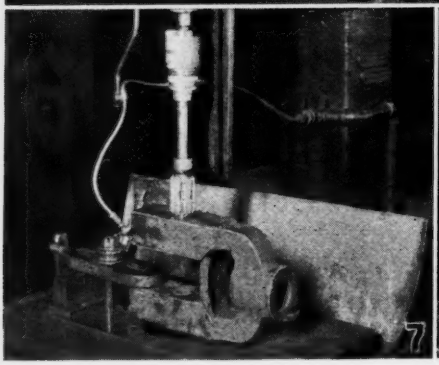
The hone is used in this shop to finish the holes in link blocks, eccentric rod pin bushings, radius bar bushings, valve cross-heads, Baker valve rods, radius bar lifters, and all eccentric rod bushings. It is also used to hone air motor cylinders and air hammer barrels for oversize pistons. The operator shown in Fig. 5 is honing out a hardened steel bushing in a connecting rod for a Baker valve gear, which is again shown in position in Fig. 6. The hole in the bushing was originally machined to 2½ in. diameter, but it naturally shrank in hardening and quite possibly was compressed still further in the pressing-in operation, as it was pressed in under 5 to 8 tons pressure. At any rate, when in place the bushing was found to be approximately .008 in. small. The bushing was honed to exact size with the equipment shown in 10 minutes.

Hardened steel bushings are also pressed into the valve cross-heads and honed to size as shown in Fig. 7. This cross-head required only one new bushing, therefore one new bushing was put in and both the old and new bushings were honed to .015 in. over the standard size of 1¾ inches.

A valve rod for a Baker valve gear is shown in Fig. 8, set up to have the hole honed to a sliding fit for a 1.750 in. shaft. The piece is located centrally by resting the journals in V-blocks, then a strap clamp is used to hold the piece in position.

The bearing holes in link blocks are honed to size with the equipment shown in Fig. 9. New blocks are honed to a standard size of 2 in., and the pins are ground to fit. On repairs, the old pins are re-hardened and trued up on the grinding machine, then the block





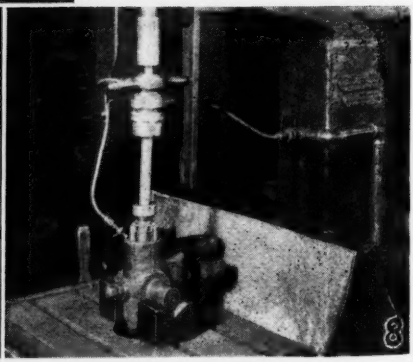
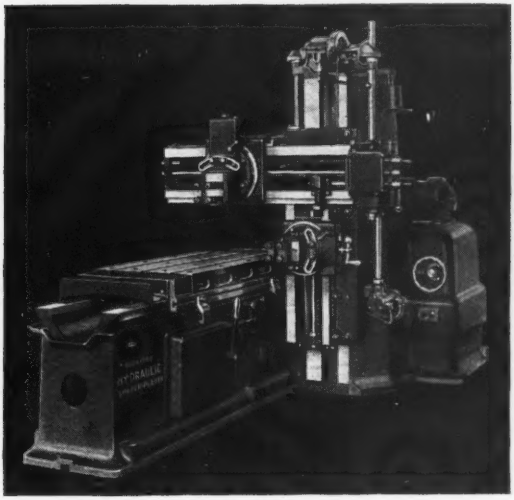


Fig. 6—Close-up view of Baker valve gear and hone. Fig. 7—Honing bushing in valve crosshead. Fig. 8—Bearings in valve rods are also finished by this process.

why BIG SHOPS USE HY-DRAULIC SHAPER-PLANERS



In big shops, or in *any* shop where work is machined in large lots, Rockford Hy-Draulic Shaper-Planers are used because—

1 The *exact* speed and feed for maximum production can be adjusted instantly.

2 Maximum cutting pressure is reached when the tool enters the metal, and *it remains constant throughout the cut.*

3 Table reversals are *smooth, quick* and *shockless.*

4 Quick return *is* quick—*three times cutting speed.*

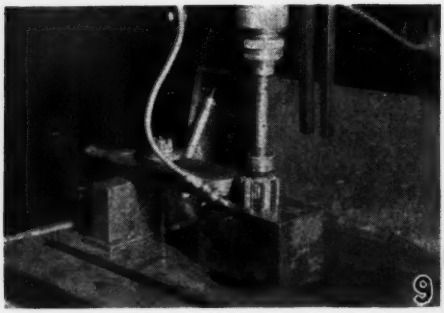
5 Rapid traverses take tools quickly from one surface to the next.

6 Tools run 60% to 80% longer between grinds.

These are the *main* reasons why Rockford Hy-Draulic Shaper-Planers are profitable on mass production. The high accuracy for the machine cuts inspection costs, its efficiency reduces power consumption, its durability and complete lubrication save maintenance expense.

There are many other reasons why Rockford Hy-Draulic Shaper-Planers are a good "buy." Write today for circular containing complete description with specifications and see for yourself.

ROCKFORD MACHINE TOOL CO.
2414 KISHWAUKEE STREET « » ROCKFORD, ILLINOIS



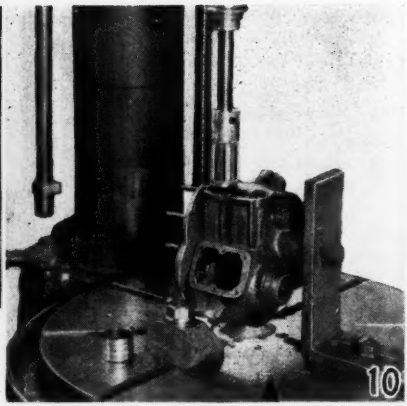


Fig. 9—Honing bearing hole in link block. Fig. 10—Honing cylinders of air motor for oversize pistons.

is re-bushed and the hole is honed to fit.

The hone provides a quick and efficient method of keeping the air tools in first-class shape. Whenever the pistons and cylinders of an air motor become worn to such a point that the power of the tool is reduced considerably, the motor is set up as shown in Fig. 10 and the cylinders are honed enough oversize to true up the bores and remove all scores and scratches. Then oversize pistons are ground to fit and assembled to the motor, making it as good as new. Air hammers are also maintained in good order by the same process. Repairs are, of course, expedited by having a stock of oversize pistons for these tools on hand.

Grinding "Kinks"

Wheels used for external cylindrical grinding should be a little harder than those used for internal and surface grinding. The reason is area of contact. You can readily see that the contact of two cylinders (as with external cylindrical grinding) is a narrow line as compared with the contact of one cylinder and a plane surface or one cylinder inside another cylinder. And naturally, the smaller the area of contact, the higher will be the unit pressure between wheel and work. The higher the unit pressure the more is the tendency to break down the wheel, which calls for a harder grade.

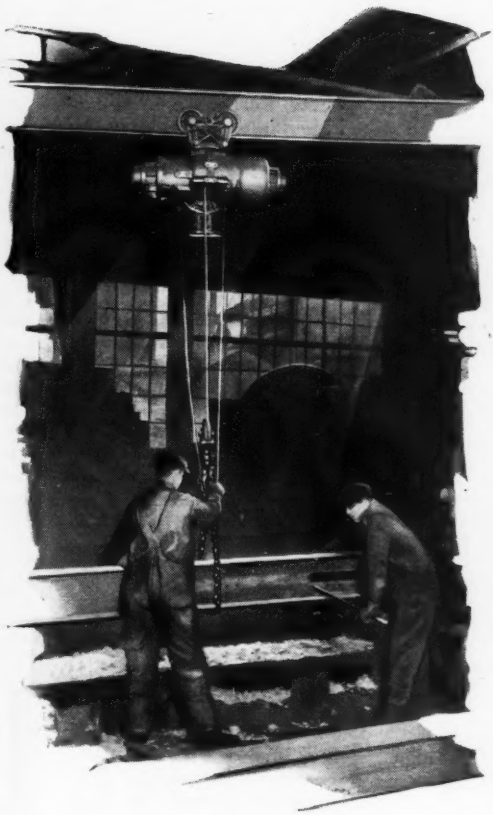
When you use the side of the wheel as surfacing with the side of a cup or cylinder, the area of contact is even greater than surfacing with the periphery, and a wheel of a much softer grade is required.

One might think that hard steel, being stronger than soft steel, would be the more resistant to grinding. Such, however, is not always the case. In fact, I know of several comparisons by which, under the same rate of feed, soft steel wore the wheel faster than did hard steel. Part of the answer is that resistance to abrasion depends upon the energy required to tear the steel apart. Because soft steel is ductile as compared with practically no ductility in hard steel, as much or more energy is required to shred the former, in spite of its lower strength. Another part of the answer is that soft steel is more likely to load the wheel. Load (which is particles of the work stuck to the face of the wheel) is an impediment to grinding and causes extra pressure on the wheel, tending to wear it down.

—(Norton Company)

Production is faster

WHEN BRAIN REPLACES BRAWN!



PLANNED overhead load-handling with Shepard Electric Hoists! That's the profitable way to remove brawn from a production schedule. Make every helper a Shepard.

Hang one over every machine! Run it on a jib, an I-beam crane or monorail and production is speeded. There's no time out waiting for the traveling crane—no call for back-breaking effort.

Shepard Electric Hoists are effecting striking economies throughout industry in handling loads of every description. There are two good reasons . . . 5,000 standard types and sizes, assuring the hoist precisely suited to every need . . . design that is unexcelled, combining "balanced" drive, automatic oil bath lubrication, complete enclosure for vital parts and unit construction.

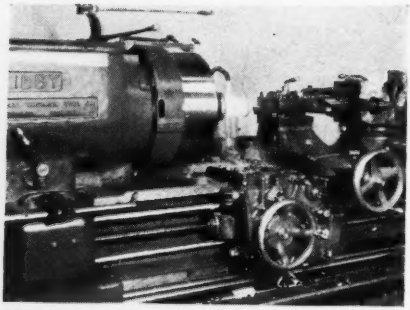
Representative examples of savings effected by planned overhead load-handling are given in the book, "Illustrated Economies." Write for a copy.

SHEPARD NILES CRANE & HOIST CORP.
Main Office: 424 Schuyler Ave., Montour Falls, N.Y.
Works: Montour Falls, N.Y., and Philadelphia, Pa.

SHEPARD
CRANE & HOIST DIVISION

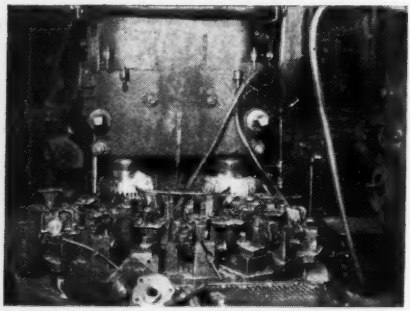
THE MOST COMPLETE LINE OF CRANES & HOISTS IN AMERICA

FASTER WORK . . . BETTER
On practically all types



Courtesy of International Machine Tool Co., Indianapolis, Ind.

OPERATION: TURNING AND DRILLING CROSS HEAD PIN.
MACHINE: 3H." LIBBY TURRET LATHE.
MATERIAL: .45 CARBON STEEL.
TOOLS: CARBOLOY.
STOCK REMOVED: 2 INCHES.
FEED: ⅛ INCH.
SPEED: 125 R. P. M.
TIME: 11 MINUTES.
LUBRICANT: 1 PART SUNOCO TO 15 PARTS WATER.



Courtesy of Warner Corporation Muncie, Ind.

OPERATION: SURFACE MILLING STEERING GEAR CASES.
MACHINE: NEWTON NO. 50 VERTICAL MILLER.
MATERIAL: MALLEABLE IRON.
CUTTERS: 12 INCH DIAMETER, INSERTED TOOTH.
WIDTH OF CUT: 11 INCHES.
DEPTH OF CUT: ⅛ INCH.
SPINDLE SPEED: 65 R. P. M.—180 S. F. P. M.
FEED: 24 INCHES PER MINUTE.
PRODUCTION: 144 PIECES PER HOUR.
LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.

WHATEVER the nature of metal parts you manufacture—let it be gears, nuts, bolts, ball-bearings or small typewriter parts—whether your equipment consists of lathes, millers, threaders, slotters or grinders—if you work in brass, bronze, copper, aluminum, machine screw stock, high carbon or alloy steels or monel metal, you will find the Sun Oil Company produces cutting lubricants of outstanding efficiency for your work.

In Sunoco Emulsifying Cutting Oil, for instance, you have available a lubricant most widely and favorably known in the trade for its aid in producing faster work with better finish at lower costs. A roll call of Sunoco users reads like a "Who's Who" of the metal working industry. It has long been our privilege, as it is now, to show typical examples of how Sunoco is serving efficiently and economically in leading metal cutting plants.

SUN OIL COMPANY, Philadelphia, U. S. A.

SUN
EMULSIFYING
Made by SUN OIL CO. *producers*

AKRON, ALBANY, ALLENTOWN, ATLANTIC CITY, BALTIMORE, BATTLE CREEK, BEAUMONT, BINGHAMTON, BRIDGEPORT, BUFFALO, CHICAGO, CINCINNATI, CLEVELAND, COLUMBUS, DALLAS, DAYTON, DETROIT, FLINT, GRAND RAPIDS, HARRISBURG, JACKSON, MICH.

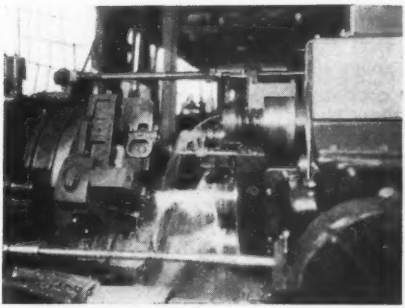
FINISH . . . LOWER COSTS *of metal or machines*

IN your own shop, SUNOCO Emulsifying Cutting Oil will:—

1. *Mix easily and stay mixed.*
2. *Be an ideal refrigerant as well as lubricant.*
3. *Act as perfect rust preventive.*
4. *Prevent system from clogging.*
5. *Require less frequent cleaning of the system.*
6. *Permit higher speeds and heavier cuts with better finish.*
7. *Never turn rancid, for it contains no animal or vegetable fats.*
8. *Prove to contain no rosin or rosin oil.*
9. *Keep workmen's hands in better condition.*

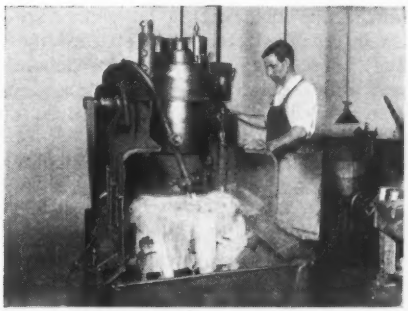
SUN OIL COMPANY ENGINEERS have offered many valuable suggestions at no cost to manufacturers for increasing outputs and lowering production costs. Prompt and intelligent attention is given to all inquiries addressed direct to Headquarters or to any of our branches.

SUN OIL COMPANY, Ltd., Montreal, Canada.



Courtesy of Warner Corporation, Muncie, Ind.

OPERATION: DRILLING, REAMING, SPOT FACING AND TAPPING STEERING GEAR CASES.
MACHINE: GOSS & DE LEEUW AUTOMATIC.
MATERIAL: MALLEABLE IRON.
SPINDLE SPEED: 200 R. P. M.
FEED: 240 FEET PER MINUTE.
TAP: 2 INCH DIAMETER, 16 PITCH.
PRODUCTION: 180 PIECES PER HOUR.
LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.



Courtesy of Foote Bros., Gear and Machine Co., Chicago, Ill.

OPERATION: GRINDING GEAR BLANKS, 18 AT A TIME.
MACHINE: BLANCHARD SURFACE GRINDER, 26 INCH ONE-PIECE MAGNETIC CHUCK.
MATERIAL: SOFT STEEL.
WHEEL: NORTON SILICATE 16 INCH X 5 INCH X 1½ INCH.
WHEEL SPEED: 1000 R. P. M.
LUBRICANT: 1 PART SUNOCO TO 40 PARTS WATER.

OCO
CUTTING OIL
of BLUE SUNOCO MOTOR FUEL

JACKSONVILLE, MIAMI, MONTREAL, NEWARK, NEW YORK, OTTAWA, PHILADELPHIA, PITTSBURGH, PROVIDENCE, QUEBEC, QUINCY, READING, ROCHESTER, SCRANTON, SYRACUSE, TAMPA, TOLEDO, TORONTO, TRENTON, TULSA, WILMINGTON

Cutting Oil Purification Reduces Tool Wear 50 Per Cent

Plants of The Federal Bearings Company, Inc., and The Schatz Manufacturing Company, Poughkeepsie, N. Y., jointly employ a De Laval cutting oil reclamation and purification system to effect several important economies.

A CUTTING oil reclamation and purification system installed several months ago in the twin plants of The Federal Bearings Company, Inc., and The Schatz Manufacturing Company, Poughkeepsie, N. Y., has effected several noteworthy economies. The principal equipment consists of a chip crusher, a 40-in. De Laval-Tolhurst centrifugal extractor, a No. 700 De Laval oil purifier, suitable tanks, and an overhead trolley system for handling the baskets of chips. This equipment will later be described at greater length.

Prior to the installation of this system, chips and cutting oil were handled in an admittedly wasteful manner, due very largely to the inefficiency and small size of the extractor used. Not only was a great deal of oil wasted due to incomplete extraction, but important losses in production occurred because of the absence of any means of purifying such oil as was recovered from the chips. Another loss occurred in the price paid for the chips by mills to which they were shipped, due to the condition in which they were received.

The cutting oil reclamation and purification system at the Federal Bearings - Schatz plant easily handles the present average production of 40 tons of chips weekly, and can care for a considerably greater output without the installation of additional equipment if required. This applies to the chip crusher, extractor and oil purifier alike.

All three of these machines have proven themselves indispensible to the economical operation of the reclamation department. Crushing as a preliminary operation enables more rapid handling of chips through the extractor, saves time and space in loading cars, and produces chips which are in greater demand by the mills and for which a premium over the price of uncrushed chips is usually obtained. More efficient extractor design saves oil, reduces labor costs and eliminates the fire hazard of an oil-soaked chip pile. Purification of the reclaimed oil enables operating speeds to be increased, decreases tool wear and makes the oil in every way a better product with which to work.

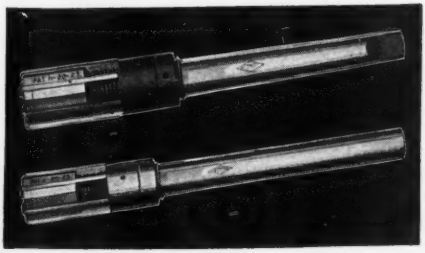
All of these points have been fully proved in the Federal Bearings-Schatz installation. The saving of labor resulting from chip crushing and improved extractor design, as well as an efficiently laid out installation, is shown by the fact that one man can handle the entire 40 tons of chips weekly, attending the crusher, extractor and oil purifier, and actually unloading the baskets of clean chips on the chip pile. Extra labor is, of course, required to deliver chips to the department and load cars. In this connection, it is stated that a 50-ton

WETMORE

ADJUSTABLE REAMERS

Wetmore is an organization of reamer specialists. It manufactures no other product. Its reputation and future depend entirely on the precision and performance of the reamers it supplies to American industry. Hence, Wetmore never permits an inferior reamer to leave the plant. The name WETMORE on a reamer is the last word in accuracy, finish, and durability . . . . . Send for latest catalog of all types of Wetmore Adjustable Machine and Cylinder Reamers and replacement blades.

WETMORE REAMER COMPANY
62 27th Street MILWAUKEE, WISCONSIN



WETMORE
TYPE NO. 8 CHUCKING REAMERS

These machine reamers are especially designed for reaming brass, bronze, and cast iron. To adjust, there are no unnecessary screws or pins to be loosened. Adjustment to .001 inch is quickly and accurately made by cone nut and lock nut at rear of blades. Straight blades are held securely by special, exclusive method. Sizes range by thirty-seconds from 5/8" to 31/32" inclusive . . .

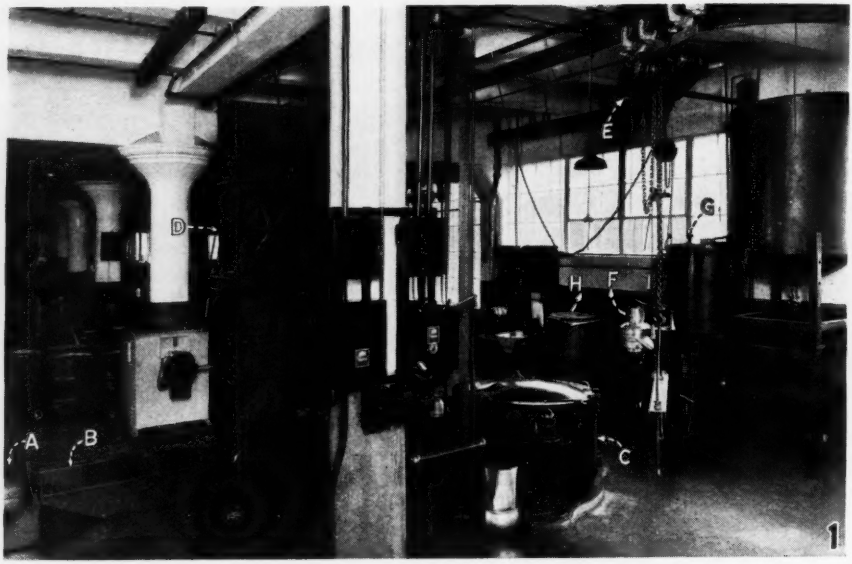


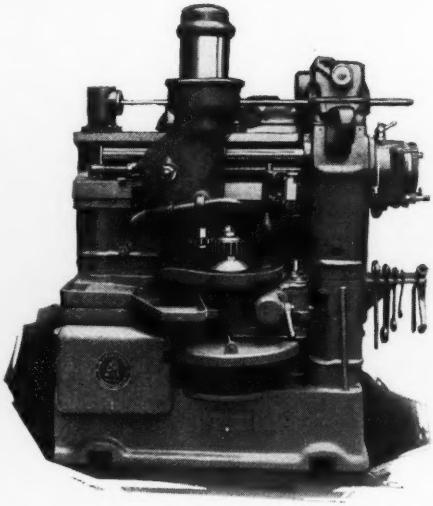
Fig. 1—Equipment for Reclaiming and Purifying Oil at the Plants of The Federal Bearings Company and The Schatz Manufacturing Company.

car is now loaded in a day by two men at less than 25 cents per ton.

The savings of oil resulting from the employment of the De Laval-Tolhurst extractor is very graphically illustrated at the plant. Whereas the outdoor chip pile always showed traces of wasted oil in small pools and saturated ground, chips are now stored indoors and there is not even a tiny trickle of oil from the pile. Indeed, the white wall against which the chips are piled does not even show discoloration from oil when the height of the pile is lowered from time to time in loading cars. If further proof of oil economy is required, it might be stated that absolutely no cutting oil has been added to the system since the installation of the equipment some three months ago, nor has there been any noticeable lowering of the quantity of oil in the storage tanks.

So far as the economy of oil purification is concerned, one may examine the records of either of two Federal Bearings-Schatz departments in order to discover whether or not purification of reclaimed cutting oil really pays. In the tool room, the records show that clean cutting oil has reduced tool troubles approximately 50 per cent. In other words, the refinishing work of this department has been cut in half due to the fact that the oil now used is a real lubricant, whereas unpurified oil carries many tiny metallic particles which actually wear down tools as rapidly as the work itself. In this connection, it might be added that the automatics throughout the plant are operating about 25 per cent above the maximum speeds recommended by the various manufacturers.

Then, if one should go to the timekeeper's office, he would find that lost time in the oil-using departments has been appreciably reduced. Inquiry among the foremen as to the reason for this reveals that most lost time cases, as well as numerous ones which do not actually involve loss of time,



6A-Type Gear Shaper

WITH

3-Inch Stroke Saddle

THE 6A-type Gear Shaper can now be obtained with what is known as a 3-inch stroke saddle, instead of 5-inches, which is the stroke capacity of the regular machine.

This new saddle considerably increases the productive capacity of the machine, because it permits the use of heavier feeds and higher reciprocating speeds.

The cutter spindle on this machine is made from a one-piece forging with guide attached. The spindle is made hollow and the counterbalance spring is enclosed within it.

Another feature worthy of notice is the drive. The spindle is provided with cylindrical rack teeth and meshing with this "rack" is an "enveloping" pinion provided with two integral keys.

You should see how this machine "hogs" out the chips. More details upon request.

The Fellows Gear Shaper Company

Head Office and Works: 78 RIVER STREET, SPRINGFIELD, VT.
Branch Office: 1149 BOOK BUILDING, DETROIT, MICH.

but considerably lower the efficiency of the operator, were formerly chargeable to boils resulting from the use of dirty cutting oil. Tiny metallic particles from the oil got into minor scratches and caused infections of a more or less serious nature. Although cleaner oil has not wholly eliminated this trouble, a very marked reduction has been noted and this is pointed to as one of the major advantages of oil purification in this plant.

Chips trucked from various parts of the Federal Bearings-Schatz plant to the oil reclamation department are dumped into a drain pan on the floor, indicated as (A) in Fig. 1. At one end of this pan is the chute (B) to the chip crusher, which is installed in a closed pit beneath the floor. While a load of crushed chips is being extracted, the operator shovels newly delivered ones into the crusher so that all idle time is eliminated. Crushed chips are discharged into an elevator or conveyor and from this they are emptied through a swinging pipe about 10 inches in diameter into the removable basket of the De Laval-Tolhurst extractor (C). (The pipe and basket cannot be seen in the illustration). An extra basket is employed so that one can be filled while another is in the machine. The swinging discharge pipe is employed on the chip elevator (D) so that baskets can be filled in either of two positions.

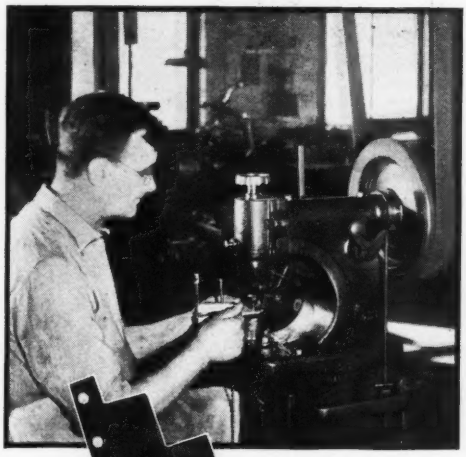
As the last drops of oil are removed from the chips in the extractor, this machine is shut down, the cover is thrown back and the basket of dry chips lifted out by means of a quarter-ton Yale electric hoist (E) which is movable on an overhead track. The operator then moves the hoist and basket of chips along this track to the chip pile where the load is dumped. Returning, the empty extractor basket is lowered in front of the chip elevator alongside its mate which has just been filled with crushed chips. The filled basket is then hoisted, moved into position over the extractor and lowered into place, covers are locked and the machine is started with an automatic switch using push-button control. The operator then swings the fill-pipe over the empty extractor basket and resumes shoveling chips into the crusher.

The De Laval oil purifier (F) and the oil handling system with which it is connected operate practically without attention. Oil discharged from the extractor flows into a sump tank installed beneath the floor and is pumped into a dirty oil storage tank located above the purifier. This tank is of about 500 gal. capacity, with a conical-shaped bottom and an outlet located a couple of inches above the cone. At the bottom of the cone there is a draw-off valve through which the heavy sediment which settles out of the oil prior to centrifugal purification may be removed, thus reducing the quantity of impurities which must be removed by the purifier and saving cleaning of the bowl.

From the oil outlet above the cone a pipe line leads to an 80-gal. insulated heating tank (G) in which the temperature of the oil is raised to about 160 degrees F. for purification. This heating tank is equipped with coils through which water, heated electrically by means of an 18-kw. Hynes heater (H) is circulated. A thermometer shows when the desired temperature has been attained and the purifier is then started. The capacities of the purifier and the oil heating apparatus are so nicely adjusted that once the desired temperature has been obtained in the heating tank, it can be maintained throughout as long a run as may be necessary.

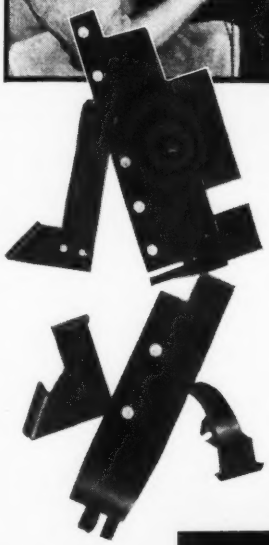
Clean oil discharged from the purifier is picked up by a pump and delivered into a storage tank on the roof of the building. Facilities for delivering oil from this tank to the various

"We have found the Campbell Nibbler indispensable"



Says Mr. Melichar, Shop Superintendent of the Mohr Lino-Saw Company, Chicago, Ill.

"WE use the Campbell Nibbling Machine to cut all sheet metal parts of our Lino-Saw which have to do with carrying the slugs to the galley after they have been cut to size," Mr. Melichar states. "We are able to cut these parts to within limits of 10/1000 of an inch—and in most cases no further finishing is necessary."



This is typical of hundreds of cases where the Campbell Nibbling Machine is used for production parts. Also, manufacturers using sheet metal parts in large quantities will install a Campbell Nibbling Machine to get into quick production while dies are being made.

Nibbling Machines are also used in tool and experimental shops—it is easy to set up and cut blanks in 1/40 to 1/50 the time needed for shaping by hand. Campbell Nibbling Machines are made to handle stock up to ¾ inch. Submit your problems to us. Address:

ANDREW C. CAMPBELL, *Inc.*
WATERBURY, CONNECTICUT

ACCO
AN ASSOCIATE COMPANY OF AMERICAN CHAIN COMPANY INC.
IN BUSINESS for Your Safety

CAMPBELL
NIBBLING MACHINES

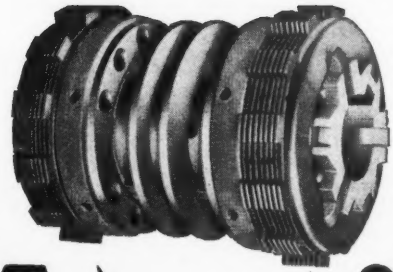
Fig. 2—The Oil Purifier and Electric Heater are Clearly Shown in this Illustration.

machines at present consist only of a pipe line leading back to the oil reclamation department. A small tank truck equipped with a hand pump is filled from this line and the oil is thus distributed to the various machines. A little later it is planned to pipe the entire plant in such a way that an oil line will run to each of the automatics.

The oil sumps of the automatics are drained and cleaned only when a machine is down for repairs. This, of course, occurs at irregular intervals, and yet it is found that the constant addition of clean oil to these machines, together with the continuous carrying away of relatively dirty oil with the chips, serves to keep the oil supply in excellent condition at all times. An interesting feature in this connection is the fact that when the installation was first put into service it was necessary to stop the oil purifier and remove sediment from the bowl at least twice during an average day's run. Since the oil supply has been cleaned up, it is now never necessary to remove sediment from the purifier more than once daily and this, of course, is done at the end of the run so that it does not interfere with the operator's other duties.

Cleaning the purifier bowl has been simplified by installing a special work bench and tools for this purpose and an overhead hoist and trolley by means of which the bowl can readily be lifted from the purifier and transferred to the cleaning table. Thus, the economies resulting from oil purification are effected at minimum cost for labor.

Things have a habit of getting lost around a dirty plant, orders don't always get out on time, and the employee who shows a real interest in his work is the exception rather than the rule. When the management keeps the plant clean inside and out, it impresses the employees with the fact that nothing but the best is acceptable there. Cleanliness is always associated with bigness and efficiency.



Model CC Twin Disc Duplex Clutch

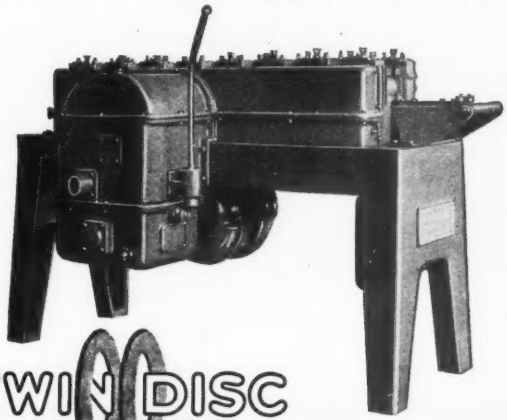
START . . . . . STOP . .

AND TWO SPEEDS AT THE TOUCH OF A FINGER . . . .

Here's a machine that forms angles, channels, mouldings, tubing, etc., from flat metal at a speed of 125 to 200 feet per minute. Such production speed demands perfect control. McKinney engineers built it in . . . with the new "CC" Twin Disc duplex action clutch, standard equipment on this machine.

Remarkably compact . . . with unusually large capacity for size, the "CC" Twin Disc clutch engages and releases smoothly, without objectionable dragging. The hub contains all the operating mechanism . . . centrifugal force operates to release pressure levers. Oil spray gives all lubrication necessary. The few adjustments necessary are easily made.

Machine designers appreciate the greater adaptability of the "CC" Twin Disc clutch. It is purposely designed to meet conditions of engineering modern, high capacity machine tools. Sizes: 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7 and 9 inches effective diameters; single or duplex, oil or dry plate types. Write for Engineering Data Book or consult our Engineering Research Department for specific recommendations. ***Twin Disc Clutch Company, Racine, Wisconsin.***



Back view of Type 1-B Roller Die Forming Machine . . . built by McKinney Tool & Mfg. Company, Cleveland, Ohio. Twin Disc Clutches built in gear box.

TWIN DISC
CLUTCHES

Waste Which Foremen Can Prevent

142 Causes of waste upon which foremen should take action NOW

The Waste of Time

1—Lack of proper planning; keeping workers waiting between jobs or waiting for material.
2—Failure on the foreman's part to thoroughly understand orders and instructions received.
3—Lack of knowledge of what constitutes a full day's work.
4—Failure to make orders and instructions clear to workers.
5—Failure to insist that tools, supplies, and portable equipment be kept in proper places.
6—Ordering overtime work that could have been avoided.
7—Not seeing that men are supplied with proper tools and equipment for every job.
8—Allowing workers to intentionally do less work than they can.
9—Failure to notify employment department when more men are needed.
10—Keeping too many men at work.
11—Failure to write records and requisitions intelligibly.
12—Failure to question and correct workers who lay off.
13—Allowing workers to get habit of talking, visiting, killing time.
14—Failure to get workers started on time; slack supervision.
15—Delay in making decisions.
16—Unnecessary absenteeism or tardiness on the foreman's part.
17—Being late with reports.
18—Not investigating immediately when repairs are needed.
19—Unnecessary visiting and conversation on the job.
20—Failure on the foreman's part to organize his own time and work.

The Waste of Ideas

1—Failure to listen and comment when workers offer suggestions.
2—Failure to encourage workers to offer suggestions.
3—Not asking worker's advice on problems.
4—Failure to read and study about the work and about business methods generally.
5—Failure to get from new men helpful ideas which they may bring from previous employment.
6—Not consulting enough with other departments, as engineering, etc.
7—Failure to consider or refer to the proper person all usable suggestions—no matter where they come from.
8—Failure to take proper interest in foremen's meetings.

The Waste of Materials and Supplies

1—Inadequate supervision resulting in spoilage of material.
(a) New men not thoroughly instructed.
(b) Men not instructed on new work.
(c) Blueprints or sketches torn or illegible.
(d) Machines out of order or not adjusted.
(e) Failure to follow each job through.
2—Failure to explain money value of materials and supplies to workers.
3—Failure to give orders and instructions clearly.
4—Permitting improper or rough handling of materials and supplies.
5—Not paying attention to workers' eyesight and health as possible causes of spoiled work.
6—Lack of discipline among workers, thereby encouraging carelessness and off-quality work.
7—Allowing men to use supplies unsuited for the work: too good or not good enough.
8—Inability to trace defective work to the man who did it so that it can be corrected.
9—Taking men's ability for granted; not making sure that workers are qualified for the work they are to do; especially new men.
10—Not knowing right kind of supplies to order.
11—Ordering more materials and supplies than necessary and not returning excess to stock.

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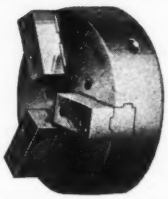
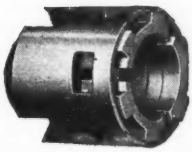
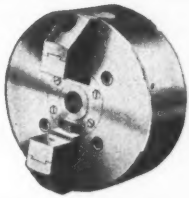


Three-Jaw Thin Body Universal Chuck



Collet Type Chuck



Two-Jaw Thin Body Universal Chuck

The New
"LOGAN" AIR CHUCKS
Have More POWER

MODERN chucking requires power .... and plenty of it. Your chucks must have sufficient power to hold work immovable against the tremendous pull of the heavy cuts possible with modern machines.

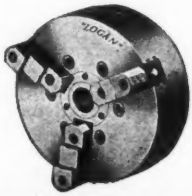
There is a New LOGAN Air Operated CHUCK for every requirement to meet these demands .... three-jaw universal chucks—combination chucks —finger type chucks—collet chucks and special chucks for your special job.

The body of each NEW LOGAN Chuck is machined from a one-piece casting, reducing the weight and the number of parts. The new design of the jaw operating mechanism gives greater leverage and more power.

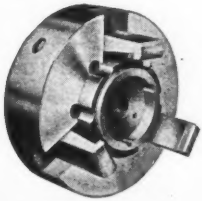
The ease and quickness with which these chucks operate effects a real saving in manual labor and increases production. Catalog S-25 outlines the details. Send for your copy!

THE LOGANSPORT MACHINE CO.

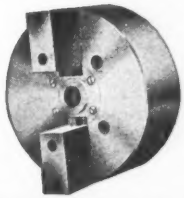
LOGANSPORT, INDIANA



Improved Three-Jaw Combination Chuck



Finger Chuck



Improved Two-Jaw Combination Chuck

12—Failure to see that materials are piled and stored properly.
13—Failure to investigate all bare wires, leaky valves, pipes, fittings on steam, water, gas, electric and compressed air lines, etc.
14—Allowing workers to use oil, compressed air, small tools, chemicals, etc., for personal use.
15—Letting defective material go through as standard.
16—Lack of system in controlling outgo of supplies to prevent loss and theft.
17—Scrapping materials that could be salvaged.
18—Permitting the waste or abuse of such supplies as brooms, waste, stationery, oilers, light globes, shovels, rubber hose, etc.

The Waste of Machinery and Equipment

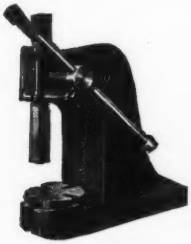
1—Failure to plan work so that full and proper use may be made of all available machinery.
2—Failure to inspect machinery to keep it in good condition and to prevent breakdowns.
3—Foreman's lack of knowledge of possible use and capacity of various machines.
4—Failure to make regular examinations of wire ropes, belts, chain drives, gear drives, conveyors, lubrication systems, valves, etc.
5—Using unnecessarily large and powerful machines for small work.
6—Lack of co-operation with maintenance department; upkeep, repairs, painting, etc.
7—Not protecting idle machinery from weather, dust, dirt, rust, fumes, etc.
8—Allowing machinery to stay dirty; lack of periodical cleaning.
9—Failure to inspect for proper lubrication of all moving parts.
10—Failure to make needed repairs promptly.
11—Lack of instruction to men on the proper operation of machinery.
12—Lack of proper discipline to prevent abuse of machinery or equipment.
13—Allowing men to make "shoestring" repairs.
14—Failure by the foreman to keep informed on latest types of machinery and equipment.
15—Failure to pay attention to worker's opinions on value and condition of machinery.
16—Abusing small machines on large work.
17—Repairing machinery that should be scrapped; may cost more than new machinery.
18—Scrapping machinery that should be repaired.

The Waste of Man Power

1—Failure to control turnover of capable workers because of the following:
(a) Not appreciating the direct and indirect costs of labor turnover.
(b) Too much "bossing" and not enough intelligent direction.
(c) Too strict or too lax enforcement of discipline.
(d) Not keeping promises which could be fulfilled.
(e) Making promises which can't be fulfilled in regard to wages, promotion, etc.
(f) Discharging men without sufficient cause; improper use of the discharge slip as a penalty.
(g) Keeping a worker on a job for which he has a violent dislike.
(h) Treating one man better or worse than others; favoritism.
(i) Taking sides in worker's arguments.
(j) Criticizing one worker to another.
(k) Failure to question men who leave of their own accord.
(l) Failure to interpret correctly management's real aims and policies to workers.
(m) Failure of the foreman to do all he can to fairly adjust wages and working conditions.

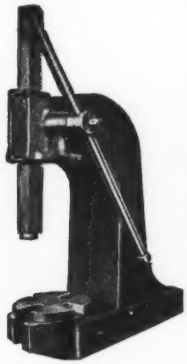
2—Failure to get full production as quickly as possible from new workers.
(a) Not receiving new workers in kindly, helpful manner.
(b) Incomplete job instructions of new workers.
(c) Failure to impress on new

No. 1 Press

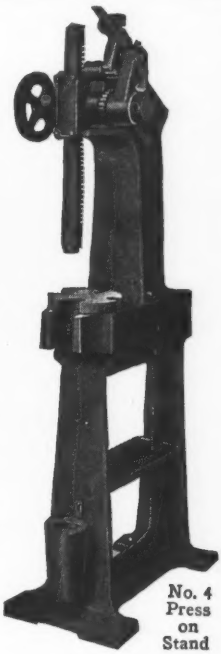


No. 2 Press

SHELDON
Arbor Presses



No. 3 Press



No. 4 Press on Stand

DESCRIPTION—Sheldon Arbor Press frames are made of semi-steel, the metal being properly distributed, giving a light and exceptionally strong casting. Rams and pinions are made of alloy steel, heat-treated. Large stub tooth is used. Rams are square, carefully fitted, insuring proper alignment.

Nos. 1 and 2 presses are furnished only with plain levers. No. 3 presses are furnished either plain or ratchet levers. No. 4 presses only with compound levers.

Floor Stands can be furnished for our No. 3 and No. 4 presses. They are made of semi-steel, are well ribbed and of heavy construction. They are provided with removable shelves and wood pots for catching mandrels, tools, etc.

— SPECIFICATIONS AND PRICES —

Ask for Complete Catalogue	No. 1 Press	No. 2 Press	No. 3P Press	No. 3R Press	No. 4 Press	No. 3 Floor Stand	No. 4 Floor Stand
Largest dia. will take.	7″	12″	16″	16″	20″		
Largest dia. mandrel..	1″	1⅝″	2½″	2½″	3″		
Height over plate....	4½″	8½″	14″	14″	18¼″		
Max. height will take.	5″	9½″	15″	15″	19½″		
Size of ram (square).	⅞″	1⅛″	1½″	1½″	1½″		
Length of ram.....	7¾″	13½″	21″	21″	26″		
Movement of ram....	5″	9¼″	15″	15″	20″		
Leverage.....	25 to 1	35 to 1	48 to 1	72 to 1	100 to 1		
Pressure on ram (tons)	¾	2	5	7½	10		
Height.....	9½″	17″	26″	26″	33½″	35″	30″
Dimensions of base...	4″x10″	6¼″x17″	8″x20″	8″x20″	8″x24″	14″x22″	14″x25″
Net weight.....	19 lbs.	75 lbs	150 lbs.	215 lbs.	320 lbs.	145 lbs.	185 lbs.
Weight crated.....	20 lbs.	85 lbs.	170 lbs.	240 lbs.	360 lbs.	150 lbs.	195 lbs.
Price, F.O.B. Chicago.	$10.00	$20.00	$30.00	$40.00	$75.00	$20.00	$30.00

No. 3-R Press

SHELDON MACHINE CO.

3251 COTTAGE GROVE AVE. CHICAGO, ILLINOIS

worker the necessity of a full day's work, and what it consists of.

(d) Failure to select new men with proper qualifications for work to be done.

(e) Impatience with new men who learn slowly.

(f) Failure to get other workers to show a friendly, helpful attitude to new men.

(g) Failure to contact new worker as often as may be required.

(h) Not informing new worker as to plant living conditions and regulations, as safety, paydays, lavatories, drinking water, lockers, washrooms, etc.

(i) Lack of information to new worker about unpleasant or dangerous parts of his work.

3—Failure to get the best efforts of which workers are capable.

(a) Failure to commend men for doing good work.

(b) Failure to explain as much about the work as possible in order to make it interesting.

(c) Lack of interest in worker's progress and personal affairs.

(d) Failure on the foreman's part to admit a mistake to worker.

(e) Lack of attention to worker's ability and temperament in assigning work to him.

(f) Failure to study men as individuals in order to get their best efforts.

(g) Countenancing the formation of cliques or groups among workers.

(h) Rating men on any grounds but competence; racial, religious, fraternal, etc.

(i) Keeping a man in a job for which he is physically or mentally unsuited.

(j) Permitting a man to remain at work when he is sick.

(k) Not giving men all the help they need.

(l) Failure to promote workers when it is possible and advisable.

(m) Lack of due consideration of problems affecting wages and working conditions.

(n) Failure to train an understudy.

The Waste of Accidents

1—Failure to recognize accident-prevention as part of production.

2—Failure to give all men thorough instruction in safe practices.

3—Failure to install mechanical safeguards and to keep them in repair.

4—Allowing men to work with guards out of place.

5—Failure to display danger signs at proper places and to see that they are clean and legible.

6—Failure to thoroughly understand indirect accident costs.

7—Poor housekeeping.

8—Lack of understanding of what constitutes an accident hazard.

9—Failure to keep records of accidents, to analyze them, and to use the information gained.

10—Not setting a good example in the matter of safe practices.

11—Lack of regular and conscientious safety inspection.

12—Failure to enforce consistently all safety rules and regulations.

13—Allowing men to work without necessary protective devices such as goggles, welding helmets, safety shoes, safety belts, etc.

14—Failure by the foreman to recognize his responsibility for accidents in his department.

15—Failure to stimulate and maintain interest of employees in accident-prevention.

16—Lack of co-operation with state and insurance inspectors.

The Waste of Non-cooperation

1—Failure to cooperate

(a) with other foremen and departments.

(b) with clerical, engineering, sales, employment departments, etc.

2—Lack of thorough understanding of company policies and failure to explain them to workers.

3—Failure to deal sensibly with gossip and tale-bearing.

4—Passing the buck; to other foremen, to workers or to management.

5—Not adequately representing the workers to the management.

LEADERSHIP

Williams' line of quality wrenches comprises two distinct types; Carbon Steel Wrenches and "Super-renches" (chrome-molybdenum). Available in 50 patterns, more than 1000 sizes. Ask for literature.

J. H. WILLIAMS & CO.
"The Wrench People"
New York BUFFALO Chicago
"Buy it from the Distributor"

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
DROP-FORGED WRENCHES

6—Permitting disgruntled employees to agitate against the company.
7—Failure by foreman to give full support to unpopular company regulations.
8—Failure to promote friendliness and co-operation among workers.
9—Thoughtless criticism by the foreman himself of any company policy or of any individual in the organization.
10—Not co-operating whole-heartedly with management in its educational activities, such as apprentice training, bulletin boards, employee's magazines, suggestion systems, safety meetings, etc.

The Waste of Space

1—Improper piling or storage of materials.
2—Not enough attention paid to routing of materials thru plant.
3—Wrong placement of machines and other permanent equipment.
4—Allowing men to leave portable tools, ladders, wheel barrows, etc., in way of other workers; failure to keep passageways clear.
5—Keeping material which should be scrapped.
6—Lockers, oil tanks, stock supplies, etc., in inconvenient places.
7—Letting unused machinery and equipment take up valuable space.
8—Leaving needed space unused for want of needed repairs to roof, floor, etc.
9—Allowing "dark spots" in plant; inefficient lighting.
10—Failure to maintain order and good housekeeping in department.
11—Keeping unnecessary materials at work-places.

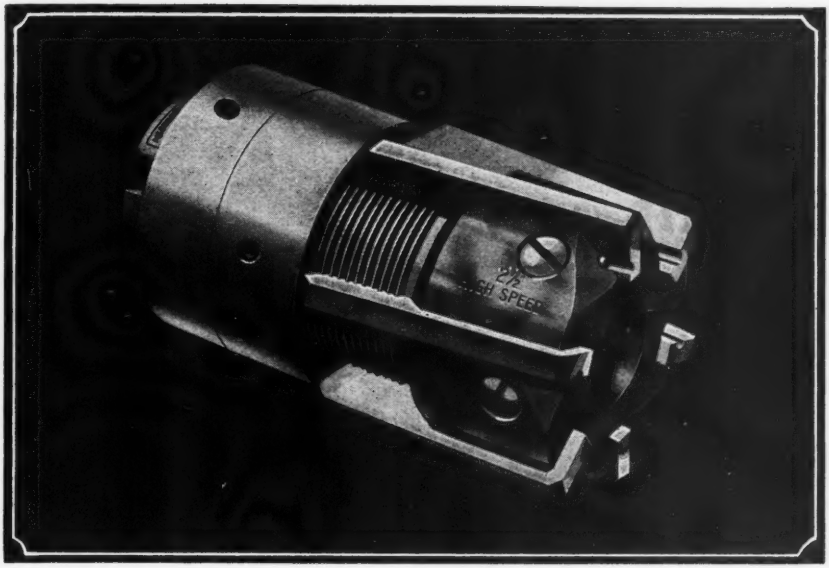
"Waste Which Foremen Can Prevent" in the form of a wall chart 22 x 34 in. can be obtained without charge by addressing the Elliott Service Company, 248 West 55th St., New York City

Tool Grinding

LACK of care in grinding has ruined many otherwise perfectly good dies and other tools. Dies and tools should be ground as far as possible before they are hardened, so as to reduce the hazards incurred in the grinding operations. The friction of the grinding wheel against the metal generates heat very quickly and it is an easy matter for an unskilled or careless workman to apply too much pressure to the wheel, raising the temperature at the point of contact sufficient to draw the temper of the metal and thus render it useless for the purpose for which it was intended. This sudden increase in temperature also expands the metal at this point, and as the adjoining metal is hard and brittle, small cracks form in the surface. These surface cracks usually appear as fine lines running in all directions, and the fractured edges often seem to be raised above the surface.

Hardened tool steel should be ground with a soft, coarse wheel, taking a light cut and operating at a slow feed. When the surface of a die or tool has been filled with surface cracks by too-rapid grinding, any attempt to remove the cracks by further grinding will be useless, as the cracks will continue down into the body of the metal as fast as the surface is ground off. The only sure way to eliminate surface cracks is to anneal the steel, machine off the surface, and reharden the piece. Consequently, as the time thus spent represents a total loss, it is much cheaper to avoid this error by proceeding slowly and carefully.

Give the boss more than he has a right to expect, and if he is any kind of a boss he will see that you are properly rewarded. If he doesn't, no man can succeed under him—and you had better find a new job.—Walter P. Chrysler.



After All, It's the Tools That Do the Cutting

WHEN it comes right down to the final analysis, no matter how husky the machine, how powerful or how fast, if the tools fail production fails.

Realizing the important part that tools must play in production, McCrosky designs and builds Adjustable Reamers and Reaming Bars to meet tough, exacting assignments.

Bodies of McCrosky-SUPER Reamers are hardened. They are relieved in front of the cutting edges for clearance and lubrication. Blades are held by a simple and positive lock. Each set of blades has a liberal adjustment range, and new blades can be easily inserted in the original body.

Bulletin No. 12-A shows all styles of standard McCrosky-SUPER Reamers and examples of special reamers and line bars made by McCrosky. Send for a copy.

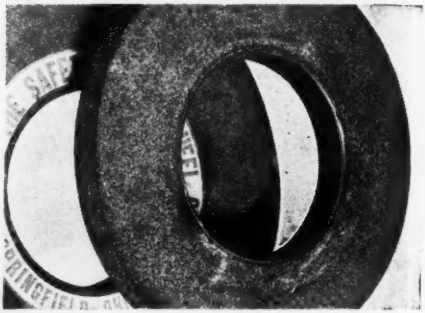
McCrosky Tool Corporation

MEADVILLE, PA.

Branches in Cleveland, Detroit, Chicago, Toronto

Big wheels that *mount easy* and *run true*

The lead lining in these SAFETY "Perfec-Hole" wheels is perfectly sized to an accurate slip-fit on the adapters . . . yet the lead veneer is only 1/32 in. thick . . . and is firmly imbedded in the grain of the wheel. (Process patent applied for.)



NOW, for the first time, it is possible to obtain large-hole wheels with perfectly sized lead centers — accurate to tolerance measured by the width of a hair . . . yet with the embedded lead veneer so thin that the running balance will not be affected as the wheels wear away. • These SAFETY "Perfec-Hole" wheels slip on to the adapters snugly, but without forcing. The soft lead inside surface can't score the adapters. And the wheels maintain perfect running balance from first to last. We are prepared to back all these claims to the limit, and invite you to test them to your own satisfaction. • SAFETY "Perfec-Hole" wheels are sold at regular list prices. The process is exclusive with us, and is protected by patents pending. The SAFETY Grinding Specialist in your territory will be glad to consult with you in making up a trial order. May we direct him to you?

"A wheel for every need" . . . backed by 37 years' experience.

THE SAFETY GRINDING WHEEL & MACHINE CO., SPRINGFIELD, OHIO

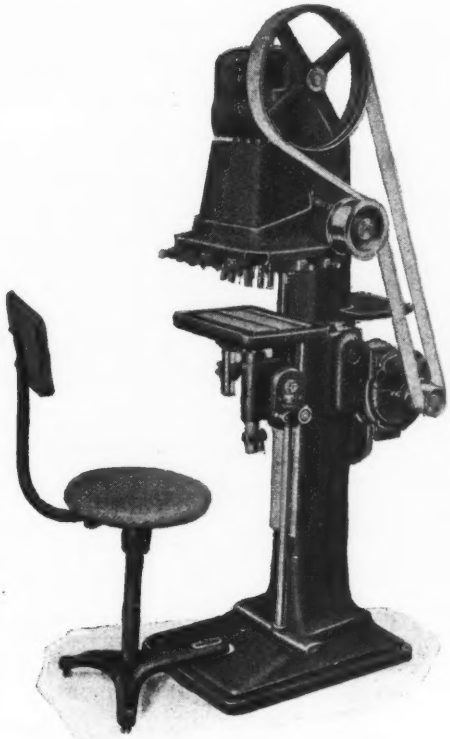
For Multi Drilling or Tapping

ONLY the "Boley" Combines These Features

Minimum Center Distance .250"

Vertical Adjustment on Spindles

One-piece Column and Head



Two Types—10 and 13 Spindle Machine

Maximum Chuck Capacity 3/8"

Eight Different Sizes of Spindles to Select From

The Boley Machine was placed on the American Market FOUR years ago. Hundreds of these machines are in use today.

Adjustable spindles can be set to any desired position. New or changed parts can be handled through this feature without expensive tool costs.

Feed operated by hand or foot lever.

INDEX MACHINERY CORPORATION

49 CENTRAL AVENUE, CINCINNATI, OHIO

Modern Tooling Practice, V.

By Frank W. Curtis

IN the high production of interchangeable parts, the milling machine is of great importance. Considered as a machine type, there are many varieties of milling machines. In fact, the process of milling is adapted to so many kinds of work that new machines, designed to employ the principle of milling as a means of removing metal, are continually being developed to assist in the solution of production problems. Hence, milling has become a recognized art and offers great possibilities for the rapid removal of stock at small cost.

The efficiency of the milling operation depends upon several factors, the most important of which may be classed as follows:

1.—Type of milling machine.
2.—Type of fixture used.
3.—Style of cutter.
4.—Speeds and feeds used.

First in importance is the kind or type of machine on which the operation is to be performed, therefore it is well to consider the adaptability of the various machines available for milling, in order that a judicious selection may be made for a given workpiece. A considerable loss of time and money often results when an unsuited machine is used for a given piece of work.

The milling machine rates highly as a producer, therefore the fixtures used with milling machines should be up-to-date and designed to obtain the best possible results from the machines to which they are applied. It is obvious that a weak fixture for work requiring the removal of a heavy cut would not produce good results, because rigidity is of first importance in milling. The important points in fixture design are: (1) Accuracy required, (2) Rigidity, (3) Chip clearance and cleaning facilities, (4) Material to be cut.

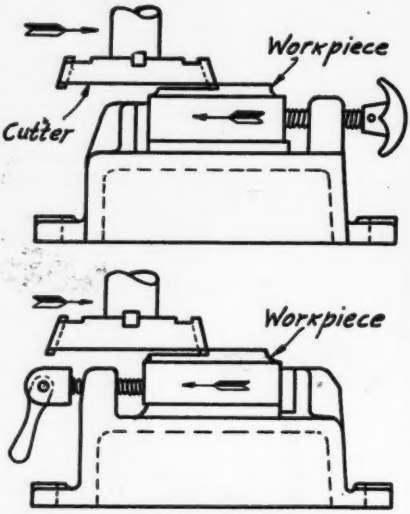
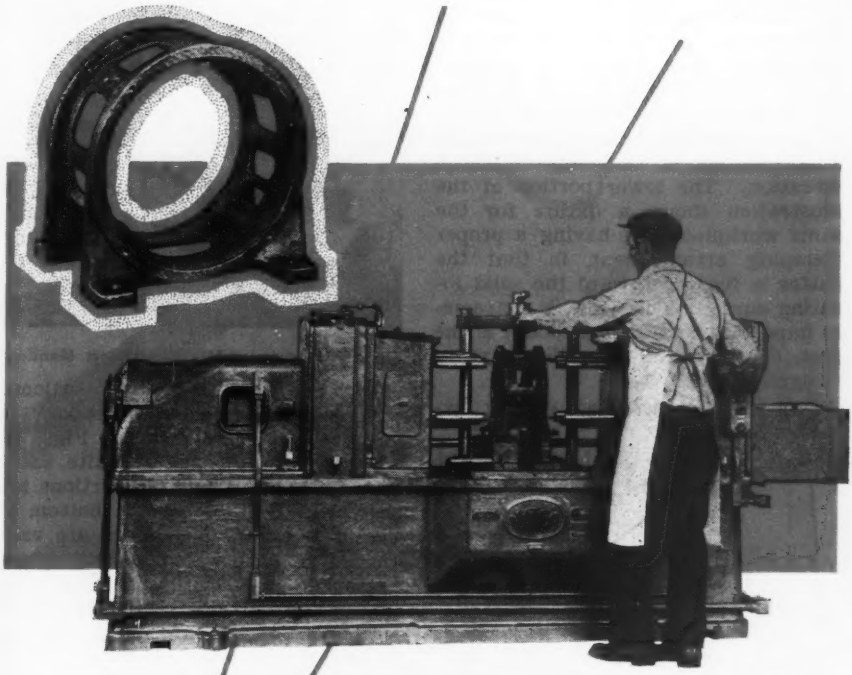


Fig. 34—Right and Wrong Methods of Clamping Work.

The machines cannot be expected to hold work to accurate dimensions and deliver a smooth finish with a poor fixture. Care must be taken to properly rib and support all necessary portions of the fixture to withstand the cutting strain. Weakness of the fixture design tends to develop "chatter" which is injurious to both the machine and to the cutters. Attention should be paid to chip clearance and cleaning facilities, and clamps should be designed so that chips will not interfere with their operation.

Clamping Methods

A milling cutter should not feed to-



110 CAST IRON MOTOR FRAMES TAPPED EVERY HOUR—

Above is shown a 2-Way NATCO Lead Screw Tapper arranged for tapping 8 holes in any one of four different sized motor frames. Sizes of holes ranging from 3/8" to 1/2", depending upon the size of the particular frame being tapped.

Machine is built of two fixed center gear driven heads, each head containing 12 spindles arranged with individual lead screws to each individual tap.

Both heads are driven by one 5 h. p. reversing motor drive unit which is semi-automatic in operation and which is provided with a push button control.

Send in blue prints of your work for our Engineers' recommendations.

NATCO
SOLVES YOUR 'HOLE' PROBLEM

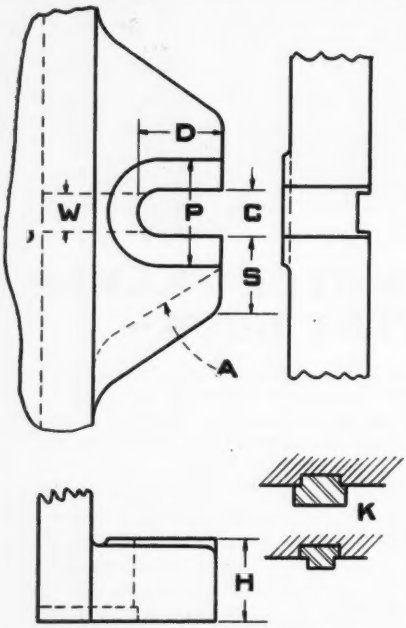
"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.

RICHMOND, INDIANA, U. S. A.

ward the clamp, due to the possibility of vibration. In Fig. 34 is shown the right and wrong principles of clamping work in a milling fixture. The upper portion of the illustration shows a cutter feeding against the clamp. This practice is very apt to cause vibration. The lower portion of the illustration shows a fixture for the same workpiece, but having a proper clamping arrangement, in that the cutter is feeding toward the solid locating surface. This point is extremely important and without doubt is the first consideration in milling-fixture design.

The properly-designed milling fixture is usually made with a cast-iron body, provided with hold-down lugs at opposite ends. These lugs are often misdesigned by being proportioned badly. If the designer will follow the practice recommended in Fig. 35, however, he will find it quite satisfactory. The various proportions are shown in the table at the bottom of the illustration. Designers are very apt to make the lug somewhat narrow as shown at **A**, with the result that the side projection is likely to break off. To be on the safe side it will pay to design lugs with generous proportions. Sometimes a fixture is made with a key way unsuited to a given machine, but by providing keys as shown at **K**, the difference can be compensated for. The upper example shows a key made larger than the slot in the fixture, whereas the one shown in the lower example is somewhat less in width.



W = Width of Key	1/4" to 3/4"
H = Height of lug	W x 1½" or more
C = Clearance for bolt	W + 1/16"
P = Pad for fastening	W x 3"
D = Depth of slot	W x 2"
S = Width of side	W x 3" (minimum)

Fig. 35—Correct Proportions for Lugs.

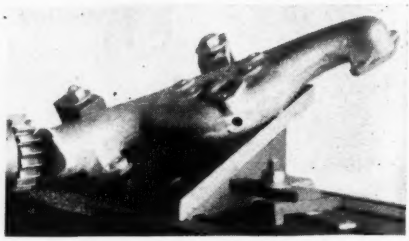


Fig. 36—Fixture for Milling Exhaust Manifold.

Many of the points discussed in drill-jig design are applicable to milling fixtures. Likewise, many of the clamps which have already been described can be used in connection with milling.

A plain-type milling fixture for the surfacing of an exhaust manifold is illustrated in Fig. 36. The work in this case has been previously machined on the underneath face and has also been drilled and reamed, so that the location is obtained by two locating plugs and two locating blocks. The work is held by means of two

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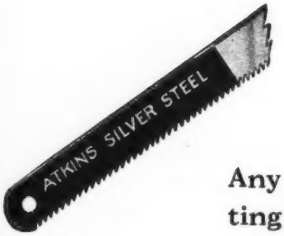

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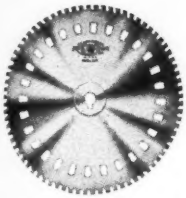

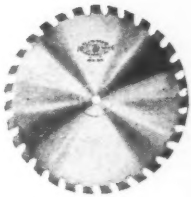

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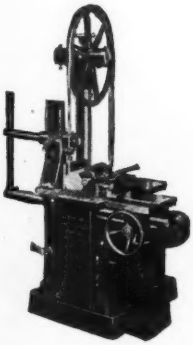

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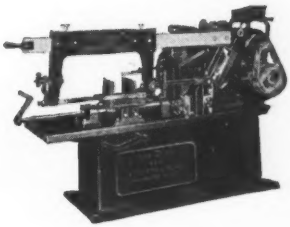

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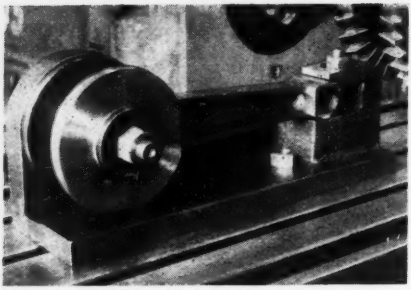

Fig. 37—Simple Fixture for Straddle Milling.

strap clamps, shown at the opposite side of the workpiece. A fixture of this type is somewhat simple in construction, but there are a great many cases where simplicity will suffice.

Another form of plain milling fixture is illustrated in Fig. 37, set up for straddle milling the wrist pin bosses of a connecting rod for a radial airplane engine. The work has been previously bored at the large end and is therefore located by means of a plug and C washer. The wrist pin end is held securely by means of a strap clamp.

A fixture for milling an elongated hole in a link of a steam engine is illustrated in Fig. 38. The opening to be milled is curved and the fixture is of the sliding type, operating in a base

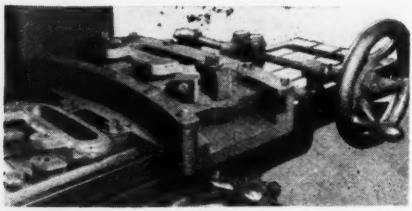

Fig. 38—Fixture for Milling a Curved Slot.

casting having curved ways to suit the radius desired. The work-holding member is fed horizontally past the cutter by means of the screw shown at the right-hand side of the fixture, to which a hand wheel is attached. When the screw is rotated, the fixture slides in the ways. The operation is performed by feeding the fixture in one direction to finish one side of the slot and then returning it for the other side.

Sometimes it is possible to mill a radial surface by means of a hand-operated fixture of the swivel type, and in Fig. 39 is illustrated a fixture for such an operation. The workpiece is a sheet-metal stamping, ⅛-in. in

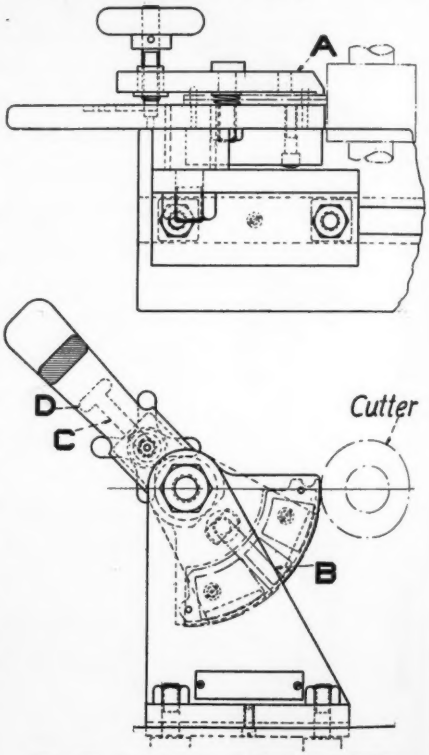

Fig. 39—Swivel-Type Fixture for Milling Radial Surface.

thickness, and two pieces are machined at one time. The pieces are located over two locating pins and are held securely in place by means of the clamp **A.** The clamp is made with an elongated slot **B,** so that it can be withdrawn from the work to facilitate

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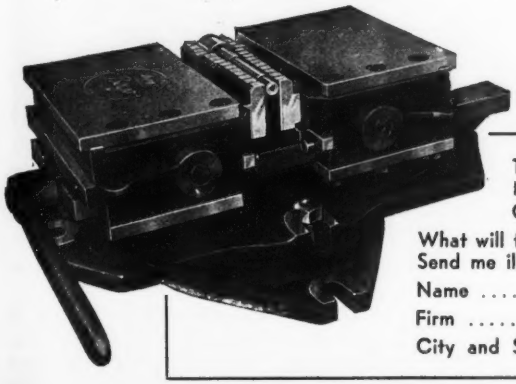

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loading and unloading. The screw that operates the clamp travels in the groove C, machined in the handle, which is made with an off-set at D so that the clamp will not slide down while the fixture is being loaded. The

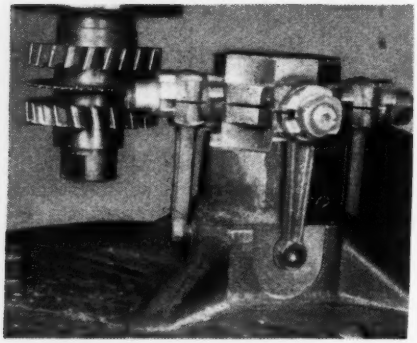

Fig. 40—Straddle-Facing Bolt Bosses and Cutting Off Cap of Connecting Rod. This Fixture Is Adaptable for "Plunge-Cut" Type of Miller.

fixture is operated by moving the handle in a downward direction with a slow steady motion. As a very small amount of stock is removed in this operation, very little effort is required to feed the work past the cutter.

A milling fixture for straddle facing the bolt bosses of connecting rods and cutting off the cap is illustrated in Fig. 40. The wrist pin holes of the rods have previously been reamed, therefore the rod is located at the small end by means of hardened locating pins. The large end likewise has been bored, providing for clamping and locating by means of plugs and C washers. The machine used for this operation is of the automatic type, arranged so that the table feeds in and out, according to rotation of the fixture. Milling operations of this type aid rapid production, the milling time per piece being generally dependent upon the time required for removing a finished piece and the loading of a piece to be milled.

Rotary Milling Fixtures

The example just described is strictly an indexing-type operation, although to some extent similar to rotary milling. Rotary milling, however, consists of feeding work past a cutter at a given rate of speed with a rotary motion. There are a great many classes of work suited to rotary milling, and various types of fixtures can be utilized. The first requirement in laying out a rotary fixture is to provide for holding as many workpieces as possible within a given diameter. To do this, the designer will find it helpful to cut out a templet, resembling the shape of the work, and place it under a piece of tracing paper so that it can be rotated in a given diameter. The outline of the part can then be traced until the correct number of pieces possible has been determined.

A rotary fixture of the plain type for holding a flat cast-iron workpiece is illustrated in Fig. 41. As the part is made with angular edges, clamping is a comparatively easy matter. Double operating clamps of the floating type are used, so that the work

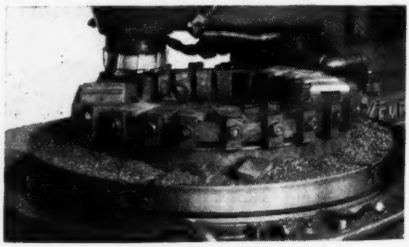

Fig. 41—A Continuous Rotary Milling Operation in Process.

can seat itself properly on the hardened locating ring.

Another form of rotary fixture is illustrated in Fig. 42. This fixture is arranged for machining two surfaces

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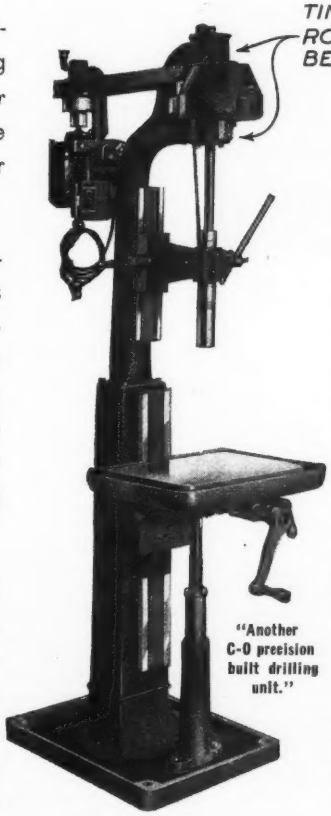

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—top and bottom—of a small casting. In this operation a number of workpieces are first clamped in the outer set of fixtures, so that the top surfaces can be machined, then the work is reversed and placed in a set of fix-

Fig. 42—Rotary Fixture Made So That Two Surfaces of Work Can Be Machined in One Fixture.

tures located nearer the center of the fixture. An outstanding feature of this fixture is the provision for chip removal. A number of cored pockets are placed around the entire periphery of the fixture casting, so that the chips will have ample chance to eject themselves.

Another rotary fixture that. performs two operations is illustrated in Fig. 43. The workpiece is a cylinder head which is first machined on one side and then reversed and relocated in another portion of the fixture for the machining of the opposite side. The fixture is arranged with four work holding stations, two for each surface.

Fig. 43 — Rotary-Milling Motor Cylinder Heads. The Fixture Provides for Milling Top and Bottom Surfaces.

Demagnetizing Steel

WHEN a piece of steel has been held on a magnetic chuck for grinding or machining, it will always retain some of the magnetism. In some cases, this residual magnetism is objectionable, as it attracts chips to the work. There are demagnetizers which are efficient for removing residual magnetism, but if one is not available, an alternating current motor makes an efficient demagnetizer. With the end spiders and rotor removed, and the terminals connected in the usual manner, a strong magnetic field of continually changing polarity is produced. Passing the work slowly through this field will remove the magnetism. This method is recommended only for intermittent use, as the coils will become overheated if the current is applied too long at a time.

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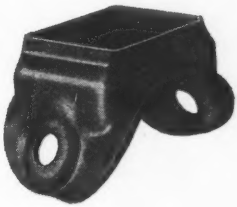

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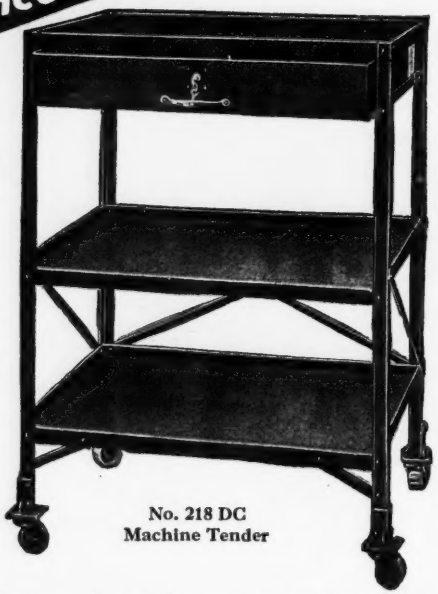

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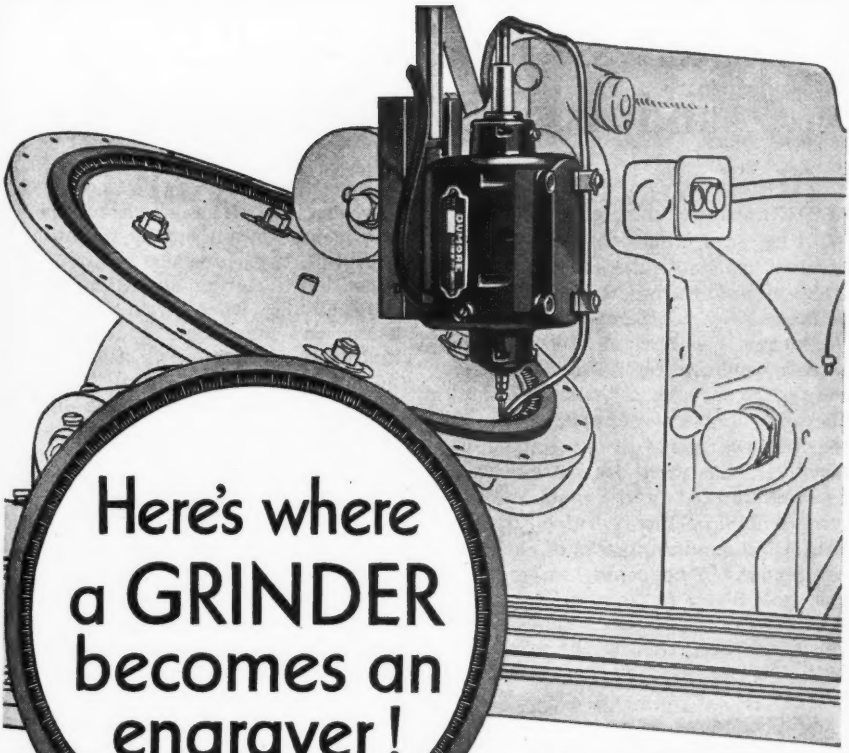

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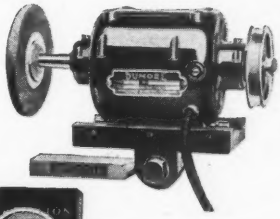

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Centerless Grinding Small Shafts and Assembled Armatures

By JOHN M. KRINGS

THE finish grinding of small armature shafts has for many years involved various difficulties for electrical manufacturers. Such hindrances as inaccuracy due to chattering, slow production, loading of the grinding wheels, and springing of the shaft were often encountered when the small diameter shafts were finish ground on the ordinary type of grinding machine. However, all such draw-backs have been eliminated in the plant of Robbins & Myers Incorporated, Springfield, Ohio, manufacturers of electrical equipment. Two centerless grinders are used in this factory, one for grinding the small shafts and the other for concentrically grinding the armatures with the shafts after they have been pressed on.

After coming from an automatic screw machine, the shafts are immediately ground in one cut by the in-feed method on the centerless grinder. Of course the centering operation, which is necessary when grinding these shafts on centertype machines, is eliminated. Shafts vary from three and four diameters down to shafts with an oversize center length of .005 in., on to which the armature is pressed.

Figure 1 illustrates a Cincinnati No. 2 centerless grinder upon which shafts 3¾ in. in length are ground by the in-feed method. Because the center length of each part is held to .005 in. oversize for the subsequent pressing on of the armature, the ends are ground to .249 in. while the center is held to .254 in. Stock removal on work of 1045 (S. A. E.) cold rolled steel totals .021 in. on ends and .016 in. in the middle. Master cams for truing the grinding and regulating wheels to the correct profile are provided so that the exact shape of the work can be imparted to the shaft in one cut.

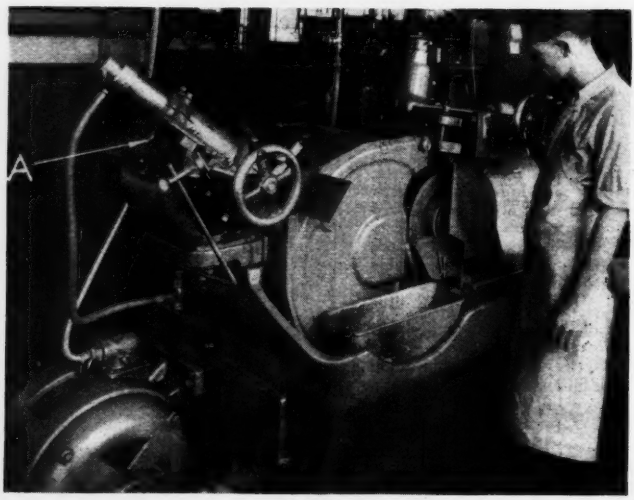

Fig. 1—Grinding armature shafts for small electric motors, using a Cincinnati centerless grinder. A production of 10 finished shafts per minute is maintained.

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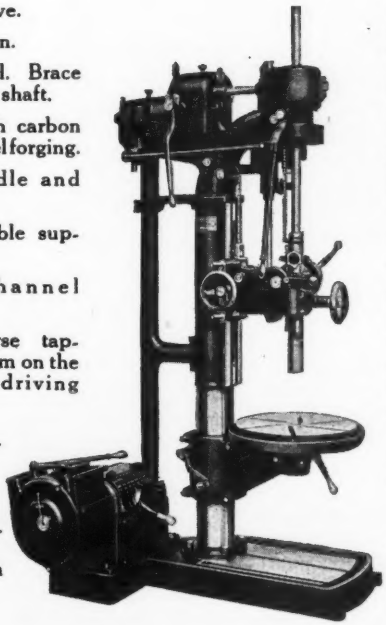

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In Figure 1, the cam and follower used for truing the grinding wheel are indicated at **A.**

The operator places one shaft at a time on the work support blade between the grinding and regulating wheels. A fixed stop puts the work in the correct grinding position. As the hand lever for the in-feed slide is lowered, the regulating wheel moves toward the grinding wheel and the shaft is quickly ground to size. A production of ten finish-ground shafts per minute is obtained on this particular set-up. Limits for roundness are .0001 in., and for size are .001 in. on the ends and .0005 in. on the middle oversize portion.

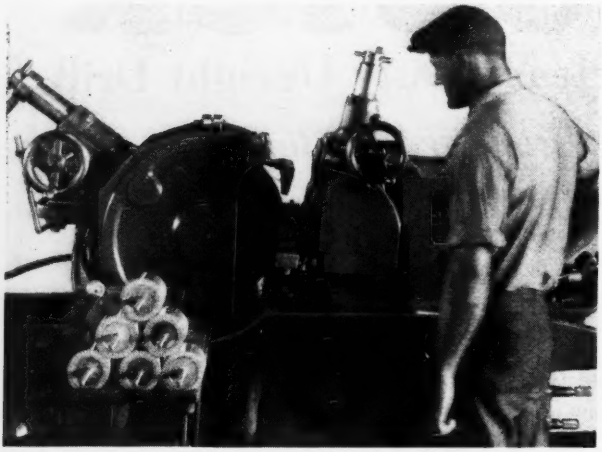

Fig. 2—The armatures are ground true with the shafts in this machine.

It is interesting to know that a saving of six to one over the method formerly employed has been effected by using the centerless method for grinding these shafts. Besides the advantage of much faster production on the centerless grinder, the accuracy of the shaft is improved by this method of grinding. Previous to the use of the centerless machine, a good deal of difficulty was encountered in the springing of the shaft and eccentric grinding. Especially was this true on the longer shafts of approximately 8 in. in length. The centerless grinder has eliminated this springing tendency, since during the grinding operation the regulating wheel gives maximum support to the work and leaves no chance for bending or springing of the shaft. Because of this rigid support by the regulating wheel, chattering of the work is eliminated, which is another factor that improves the high quality of finish.

After this grinding operation, the armatures are pressed onto the shafts, then the assembled armatures and shafts are passed to a Cincinnati No. 2 centerless grinder, which grinds the periphery of the armature concentric with the shaft. Figure 2 shows the machine and set-up for this operation.

Armatures are of electric sheet, copper and solder. Although the size of the armatures varies .030 in. to .035 in. of stock is usually removed in this operation. The method employed to grind the armature concentric with the accurately-finished shaft involves the use of floating bushings and a V-block fixture. Both ends of the shafts are inserted into the floating bushings and this unit is then placed into the V-block fixture. By using the floating bushings, marring of the shaft is guarded against and set-up time is saved. The outside diameters of the bushings are kept standardized, three different pairs of bushings being sufficient to handle 10 various-sized shafts.

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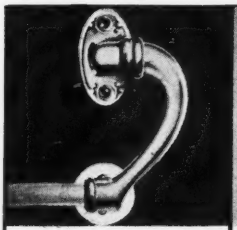
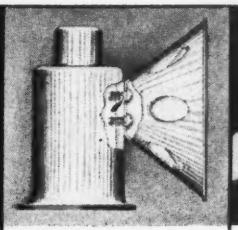
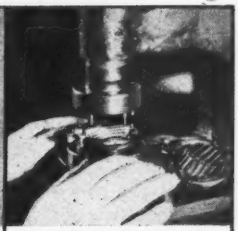


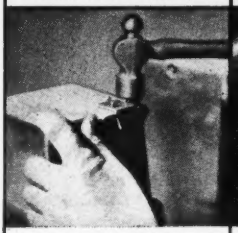
$25,321 SAVED IN ONE YEAR by prominent maker of auto hardware who uses Drive Screws in place of machine screws for assembly



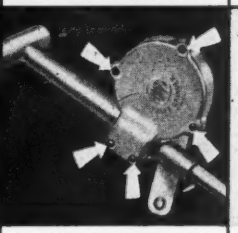
TIME AND LABOR HALVED on this Radio speaker assembly made by leading maker thru use of Drive Screws instead of machine screws.



90% TIME SAVING EFFECTED in assembling the Add-a-Tone phonograph reproducer by replacing machine screws with Drive Screws.



A COST REDUCTION OF 50% on Doehler Vending Machine assemblies through the use of Drive Screws instead of machine screws.



NO MORE SCRAPPED PARTS due to stripped machine screw threads since cover of Prompto Valve Grinder is fastened with Drive Screws.

ASSEMBLY COSTS CUT 36.6% through the use of Hardened Metallic Drive Screws for fastening float lever bracket on Zenith-Detroit carburetors.

These Six Examples

show what YOU may accomplish

A fastening may often be made with a number of different devices. But one of them is almost certain to offer greater ease, speed or security. The wise manufacturer tests and compares one with another . . . then adopts the device most advantageous to the assembly of his product. Such an approach to a fastening problem pays . . . the six examples given here prove it.

When an assembly requires a permanent fastening to iron, brass, aluminum, steel, Bakelite, etc., comparative tests usually result in the adoption of Hardened Metallic Drive Screws. No other means is so easy, speedy and economical.

Fastenings are made with these unique Screws in one simple operation. Just hammer them into holes drilled or molded in the material. They tap their own thread. And they make better fastenings than machine screws, as they will not loosen under vibration.

Always try Hardened Metallic Drive Screws. If you can use them you will save time, labor and money. Samples for test will be furnished free. Just send a brief description of your assembly.

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Dept. E, 192-196 Varick Street New York, N. Y.

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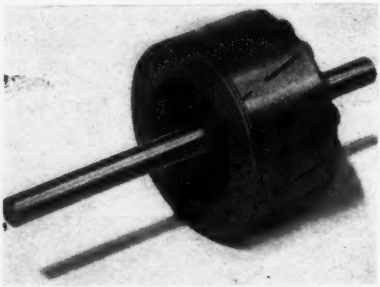


Fig. 3—Assembled shaft and armature for small motor, after grinding in the machine shown in Fig. 2.

The in-feed method of grinding is used and concentricity between the shafts and armatures held within .00075 in. Production of two armatures per minute is obtained, which is double the output obtained when these shafts were ground by the previous method.

A view of a small assembled armature and shaft which has been centerless ground to close limits and concentricity is shown in Figure 3. The precision limits and concentricity obtained on this work make the centerless method of grinding nicely adapted to handle this job. With the increase in production, manufacturing costs have dropped accordingly. In addition, since the accuracy and finish of the armatures and shafts have been improved, more efficient motor operation is assured.

Aircraft Welding

The unit members of the primary structure of an airplane are subject to tension, compression, bending stress and vibration, and their sizes are computed on the basis of one or more of these. The strength of one of such members is that quantity of force which will break the member or so deform it that it will no longer serve its structural purpose. With properly-welded joints, members of chrome-molybdenum steel tubing in tension fail well away from the weld, but within the region affected by the heating of the joint.

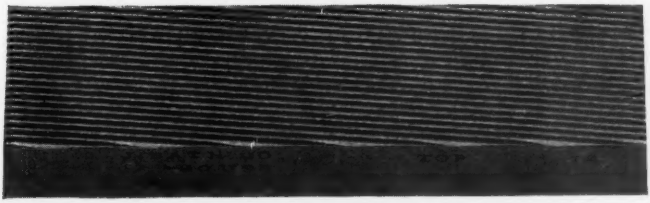
If the workmanship of the weld is poor, it is perfectly possible for its strength to fall below that of the annealed member, and thereby bring the strength of the joint below its maximum. If we define the "critical section" of a welded joint as that sectional surface through which a joint will break when subjected to sufficient stress applied in the normal manner, then the strength of the joint and the strength of the critical section are identical. In order to make this strength maximum, it is necessary to see that the critical section does not fall within the joint proper. To insure this it is necessary only for the welder to adhere to the following three conditions: The chemical state of the base metal and filler rod must be changed as little as possible, the sectional thickness of the fillet must nowhere be less than the thickness of the thinner member multiplied by the ratio of the strength of the base metal to that of the rod (after welding), and the filler must be perfectly fused to both base metals for a width equal to that of the fillet itself.

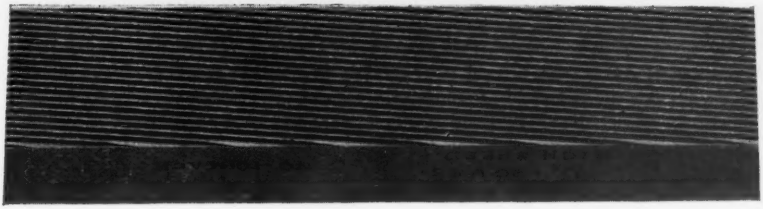
—*Kendall Perkins.*

By mentioning MODERN MACHINE SHOP when writing to the firms who are advertising in this issue, you are helping to build up a bigger and better magazine for your own benefit.

BATH GROUND THREAD ROLLING DIES

A New Factor in Making Precision Screws On a High Production Basis





BATH ROLLING DIES are "Hardened in the Solid" and "Thread Ground from the Solid" the same as Bath Taps. All heat-treating distortion is eliminated in the thread grinding.

Bath Ground Taps solve the tapped hole problem—Bath Ground Roll Dies match the accuracy of the tapped hole with precision screws approaching ground taps in accuracy.

Equally successful in rolling brass, aluminum and steel. Heat treatments are carefully controlled to give maximum productive life.

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JOHN BATH & CO. INC.
Worcester, Mass.

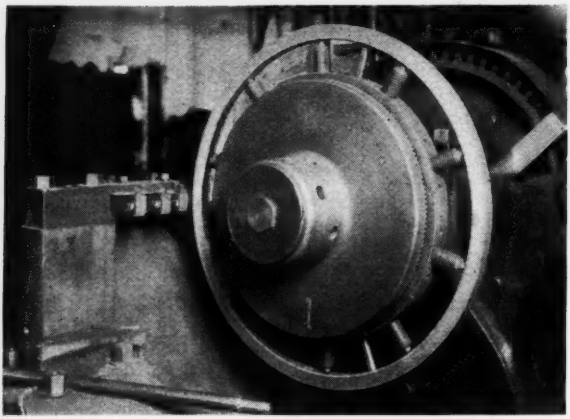
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Chuck For Turning and Straddle-Facing Large Piston Rings

By JOHN MCCULLAGH

LARGE rings, such as the piston rings used in locomotives and Diesel engines, are difficult to chuck so that both sides can be faced and the outside diameter turned at one setting. The ability to perform all these operations at one time not only results in a saving of time and money but also insures a true job.



The ring is turned and straddle-faced in one operation on this chuck.

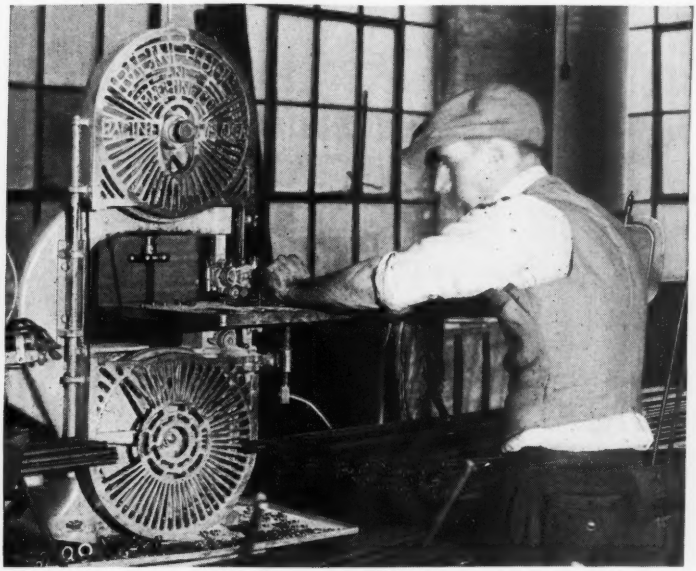
After experimenting with several forms of chucks, the one shown in the illustration was developed and used successfully. The chuck consists primarily of a shaft with a hub by which it can be attached to the spindle nose, a bevel gear, 10 combination pinions and screws, and a ring through which the screws project. The pinions are engaged by the bevel gear so that when the gear is revolved, all the pinions are revolved simultaneously and as the pinions revolve, they are fed outward by the action of the screws turning in their respective holes in the ring. The outer ends of the screws are pointed so that they will engage and hold the piston ring.

Alignment of the ring is obtained by means of three pins located at equi-distant points in the chuck body. The pins are a sliding fit in the holes in which they operate, and when not in use are held out of the way by spring-operated balls that slip into grooves in the pins. The outer, or locating, end of each pin has a flat bearing on one side to aid in locating the ring evenly over the ends of the screws when chucking. As soon as the ring is clamped, the pins are withdrawn so that they do not interfere with the cutting tools. The chuck holds the work securely and aids in producing a true and rapid job. By using two facing tools in a single tool-block, as shown, necessity for gaging is eliminated after the tools have been properly set.

(*Continued on page* 61)

Simonds Metal Band Saws Cut Steel Tubing Fast

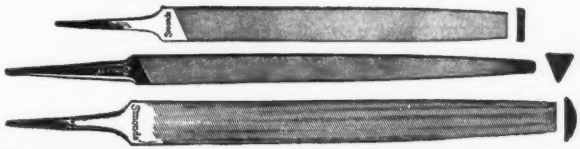
Large Maker of This Product Finds Hard Edge Bands Most Efficient—Illustration Shows Saw in Operation



ANOTHER of the Country's largest makers of steel tubing has standardized on Simonds Hard Edge Metal Band Saws because they have found that these saws have proved the most efficient for cutting the tough metal from which their products are made. For cutting steel tubing the Simonds Hard Edge blade is a time and money saver. It holds its edge, does not shell teeth and cuts true on difficult jobs.

Simonds Engineers are at your service to assist in solving your metal cutting problems. Write Simonds Saw and Steel Co., Fitchburg, Mass.

The First Stroke Tells You It's A Good File



When you grasp the handle of a SIMONDS FILE you can feel its quality. At the first stroke over the metal you know it is right. It proves up in performance as the hard, sharp teeth bite into the surface, snappy, deep and smooth. It's Simonds inbuilt quality of workmanship and finest grade steel. Famous products demand the finest tools and in files, SIMONDS means the best.

SIMONDS

METAL SAW MAKERS

The Hack Saw Blade

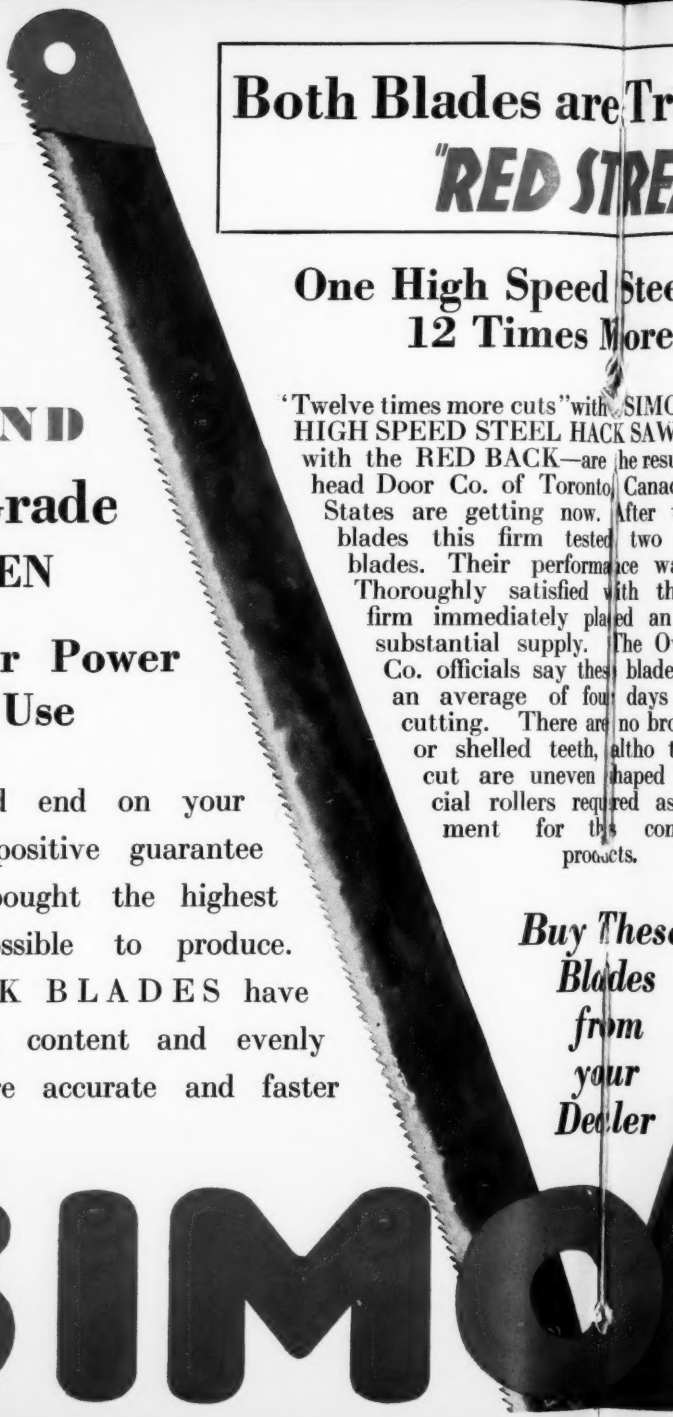
With The

RED END

is High Grade TUNGSTEN

For Hand or Power Machine Use

That brilliant red end on your Hack Saw is a positive guarantee that you have bought the highest quality blade possible to produce. RED STREAK BLADES have a higher tungsten content and evenly set teeth to assure accurate and faster metal cutting.



Both Blades are Tr

"RED STRE

One High Speed Stee 12 Times More

"Twelve times more cuts" with SIMO HIGH SPEED STEEL HACK SAW with the RED BACK—are he resu head Door Co. of Toronto, Canad States are getting now. After t blades this firm tested two blades. Their performance wa Thoroughly satisfied with th firm immediately placed an substantial supply. The O Co. officials say thes blade an average of four days cutting. There are no bro or shelled teeth, altho t cut are uneven shaped cial rollers required as ment for this con products.

Buy These Blades from your Dealer

SIMO

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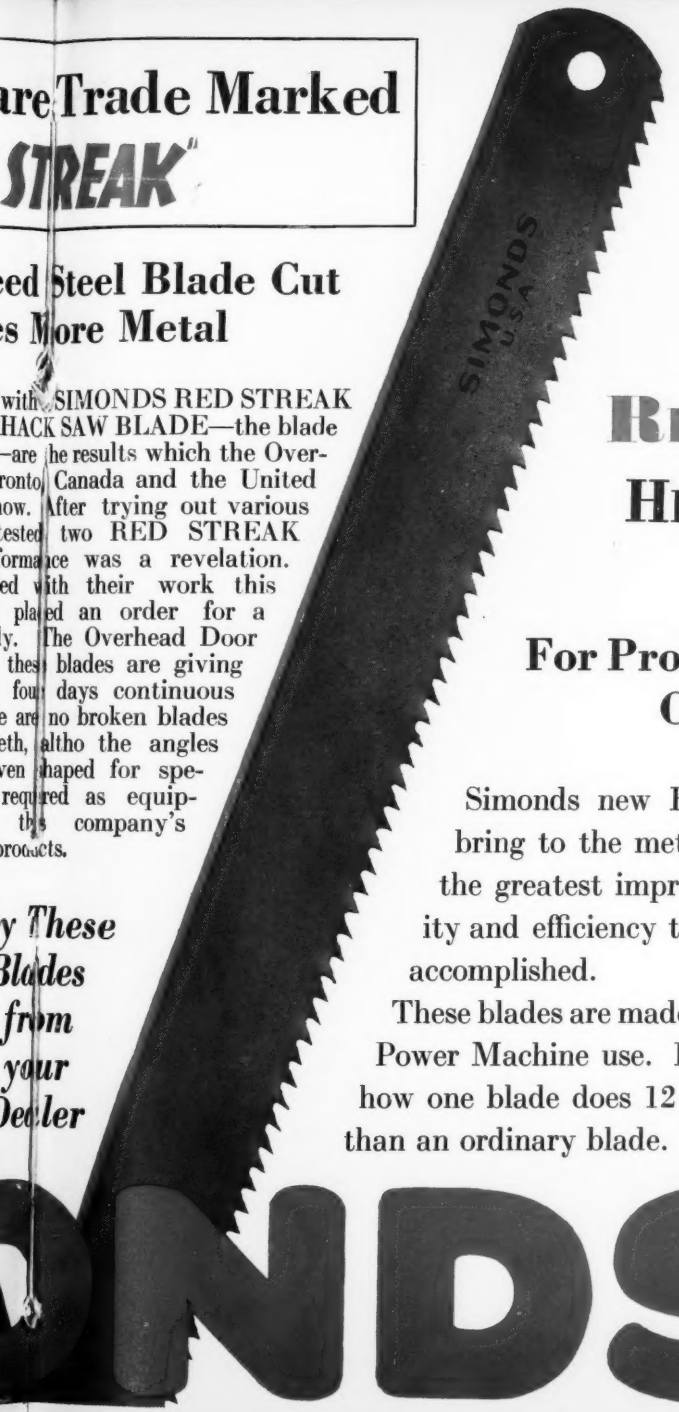
eed Steel Blade Cut es More Metal

with SIMONDS RED STREAK HACK SAW BLADE—the blade —are he results which the Over- ronto, Canada and the United ow. After trying out various ested two RED STREAK ormance was a revelation. ed with their work this pla ed an order for a ly. The Overhead Door thes blades are giving fou days continuous e are no broken blades eth, altho the angles ven shaped for spe- required as equip- th s company's products.

y These Blades from your Dealer



The Hack Saw Blade

With The

RED BACK

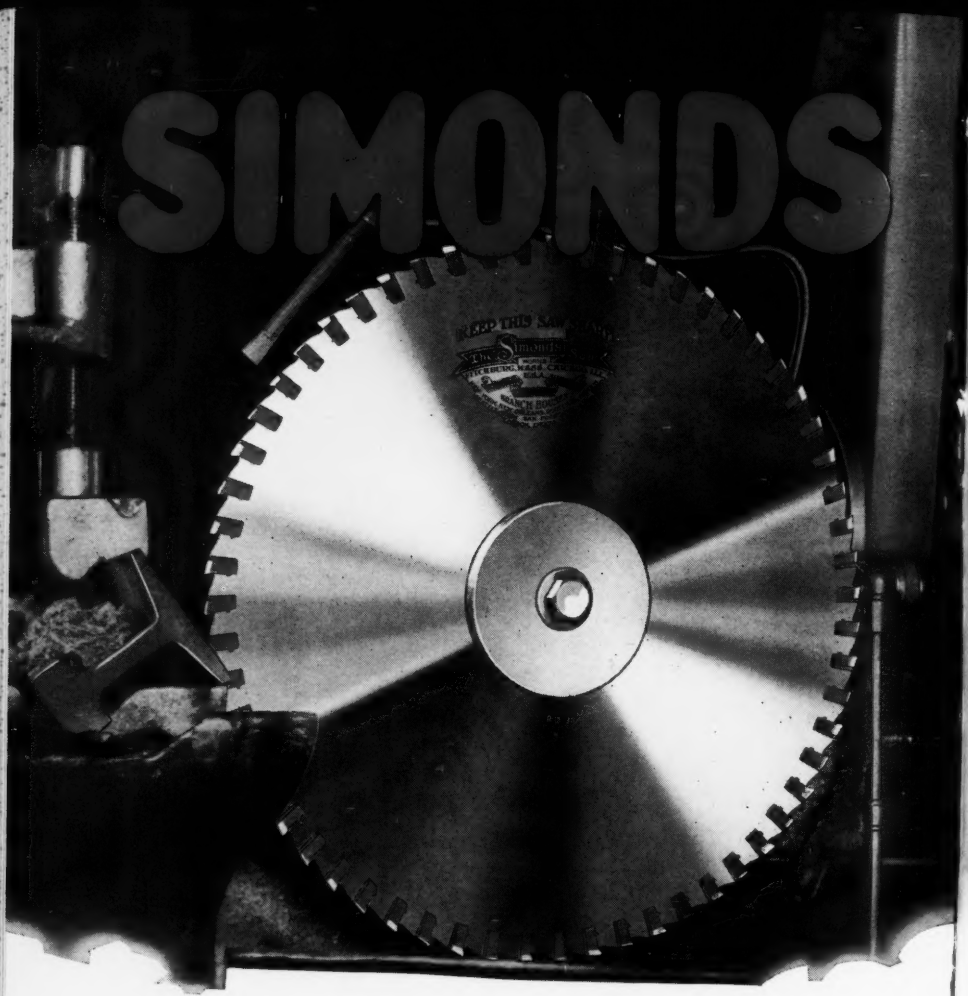
HIGH SPEED STEEL

For Production Metal Cutting

Simonds new Hack Saw Blades bring to the metal using industry the greatest improvement in Quality and efficiency that has ever been accomplished.

These blades are made for both Hand or Power Machine use. Read on this page how one blade does 12 times more work than an ordinary blade.

NDS



Red Streak Inserted Tooth Metal Cutting Saws

Have you tried the new INSERTED TOOTH SAW—THE SIMONDS SAW with the deep CURVED Gullets? It is equipped with HIGH SPEED STEEL teeth and is positively the most efficient, as well as the sturdiest saw ever produced. In many shops it is doing a most complete job, cutting difficult shapes, including structural steel, rails and switch metal—doing it with ease and speed.

Ask about it—The RED STREAK INSERTED TOOTH SAW for metal cutting.

SIMONDS SAW AND STEEL COMPANY

"The Saw Makers"

ESTABLISHED 1832 — FITCHBURG, MASS.

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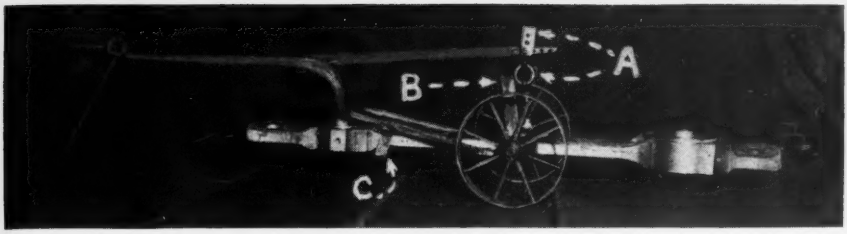


Rod Wagon with Rod in Place for Carrying.

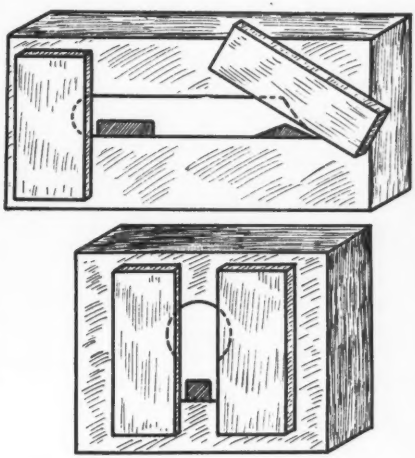
A Handy Rod Wagon

By H. H. HENSON

THE illustration shows a very simple but efficient rod wagon, with which one man can transport the heaviest sections of a side rod. The wagon consists of a frame with two wheels, and a hook for carrying the rod. The most important detail is the adjustable hook **A**, which can be set to any height to suit the type and size of rod. The forked axle **B** is mounted on two wheels with roller bearings and is attached to a steel tongue. The curved piece **C** holds the rod from swinging about while in transport. In order to couple the rod in place for carrying, the tongue is tilted upward to an angle of 45 degrees and the chain or hooks are coupled under the rod. As the tongue is pulled downward, the rod is raised clear of the ground. The wagon can be made at a minimum cost, as the frame is of common iron, welded and bolted together.

Guards For Filing Irregular Shapes

WHEN an irregular shape, such as the opening in a die, must be filed to accurate dimensions, the worker must exercise extreme care to avoid touching a finished surface with his file. Many shapes of files are made with one safety edge, without any cutting teeth, to prevent such an occurrence, but even a safety edge may cut a deep scratch in a smooth surface. Or a slip of the hand may cause the file to dig into a finished surface, so that many hours of labor may be lost. The illustration shows



Guards for use in Filing Irregular Shapes.

two examples of how the finished surfaces are protected from accident while finishing the other surfaces, by the use of hardened plates which are clamped to the top surfaces of the dies. These plates are made from pieces of scrap and are hardened so that a file will not cut them. Many diemakers may consider this method amateurish, but a trial will convince

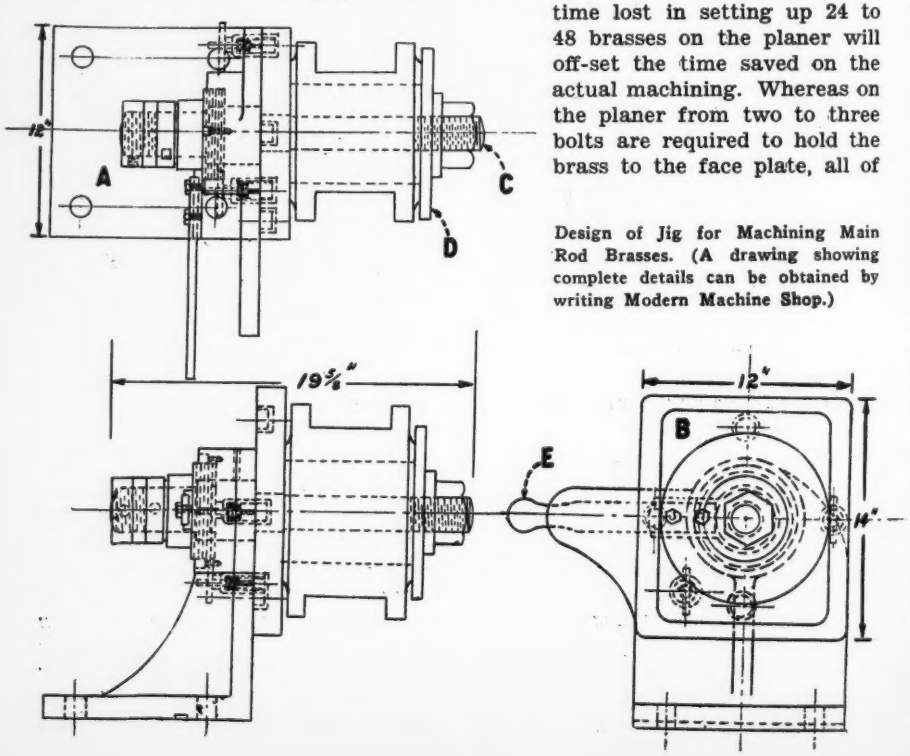
the most skeptical. In addition to preventing damage, this method will result in a saving of time, as the work can be done more rapidly and with more confidence.

Jigs for Machining Main Rod Brasses

By J. H. HAHN

ALTHOUGH the "I-type" main rod with floating bushing in the back end has been adopted by many of the railroads, there are still a good many of the old type strap rods in use with which a two-piece brass is used, held in a strap that is secured to the rod by means of taper bolts. This type of main rod will probably be in use for many years on some of the roads. The jig shown in the drawing was designed to facilitate the machine work on these brasses.

The jig can be used on the slotter, shaper, planer, milling machine or horizontal boring mill. In some shops it is the practice to handle the rod brasses in "gangs," using a planer and clamping from 12 to 48 brasses at a time to an angle plate on the planer table. Experience has shown that production on brasses machined by this method is slower than by using the jig shown, using a milling machine and machining one piece at a time, and just as good time can be made when other machines are used with this jig. The time lost in setting up 24 to 48 brasses on the planer will off-set the time saved on the actual machining. Whereas on the planer from two to three bolts are required to hold the brass to the face plate, all of



Design of Jig for Machining Main Rod Brasses. (A drawing showing complete details can be obtained by writing Modern Machine Shop.)

STANDARD & SPECIAL DRILLING & BORING MACHINES

A compiete line of standard upright drilling machines — single spindle and gangs —stationary and sliding head — belt and motor drive—with or without attachments.

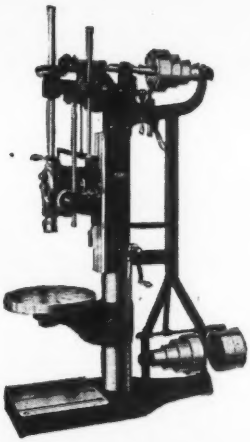
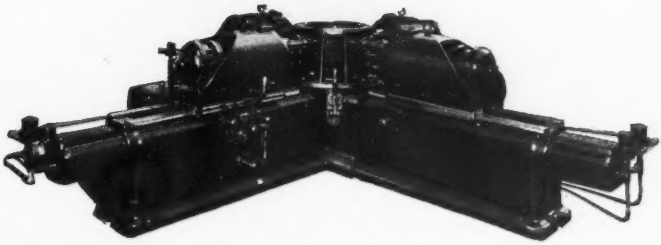


Illustration at left shows 26-inch Sliding Head Drill with Power Feed, Automatic Stop and Back Gears, arranged for belt drive.



Special single-spindle or multiple - spindle machines, working from one direction or several directions simultaneously, with or without indexing table; for high production and heavy duty drilling, boring, reaming and similar operations.

Above is shown a 4-way drilling and reaming machine with elevating fixture.

Write for booklet entitled "Performance."

A SERVICE WHICH GIVES HIGH PRODUCTION WITH LOW MAINTENANCE *by*

W. F. and John Barnes Co.

ROCKFORD, ILLINOIS

Established 1872

which must be removed and replaced with each turning of the brass, the brass is turned on the jig by one quick movement of the lever. The lever operates a clamping nut and releases an index pin, and serves to lock the piece in position after turning.

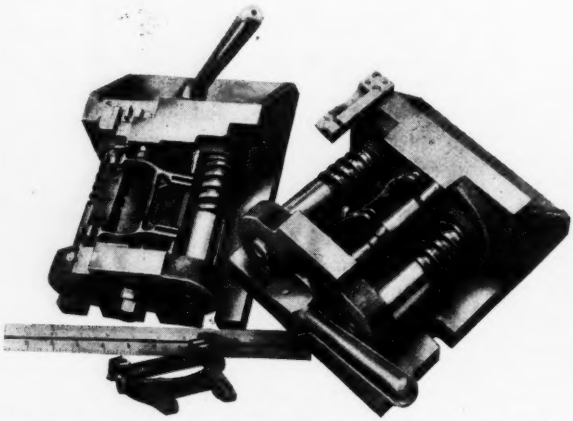
The jig consists primarily of the angle plate **A**, the plate **B** and the shaft **C**. The shaft, which is 19⅝ in. long, serves to hold the complete assembly together in addition to holding the work. The work is held in place against plate **B** by the steel serrated and hardened plate **D** and a 1¾-in. standard hexagon nut. The jig shown was made for the type of brass which has a tapered surface on the front side to accommodate the wedge used for keying the brasses when necessary. The nut is removed from the end of the shaft to change pieces, but the only action necessary in order to index the work is the movement of the hand lever **E**, which controls a locking nut at the rear of the angle plate **A**.

Using Standardized Die Sets As Fixtures

By C. G. Crowley

THERE is such a wide variety of pieces to be made and so many operations to be performed per piece that it is usually taken for granted that fixtures must be designed on the job and each designed specifically and solely for the piece and operation involved. The shop executive who takes nothing for granted, however, has found that this is not necessarily so.

One of the largest manufacturers of check protectors and adding machines is using standardized die sets as fixtures. As shown in the accompanying illustration, the die set shown is a Danly M-00, received directly from stock, completely assembled. The dieholder is mounted on an angle plate



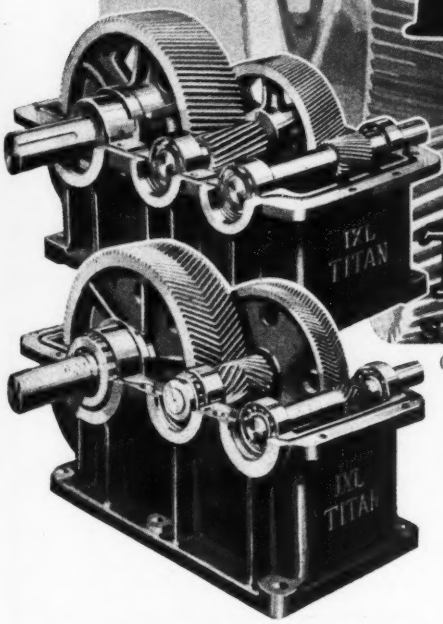
Two Danly die sets being used as fixtures, equipped with locking lever, milling guides, hardened steel stops and springs.

by means of screws of the socket head type. The punchholder is fitted with a handle or lever by which it may be closed up tight against the die holder, the piece to be milled acting as a spacer. The punchholder slides back and forth over the guide posts or guide pins which operate in bushings of steel, hardened and lapped to fit without perceptible shake. Over these pins are slipped Danly flat-round pressure-pad springs, with the ends ground square and each spring for a given size giving identical loading.

The piece being milled, as shown, consists of a handle. The handles are slipped into position and held by hardened steel stops. The lever is drawn to the right, locking the piece accurately and firmly between the punchholder and dieholder. Because both

for Heavy-Duty Drives Use IXL TITAN

HERRINGBONE OR HELICAL
SPEED REDUCERS



Every Speed reduction problem has its own specific requirements.

Proper selection of the right unit for the job is the biggest factor in satisfactory service and long life.

The "TITAN" line is available with either Herringbone or Helical types, whichever best suits your special requirements. Call on our Engineering Department to get the relative merits of these two types as they apply to your special job.

Seventy Years of Engineering Experience Is Behind the "TITAN" Line

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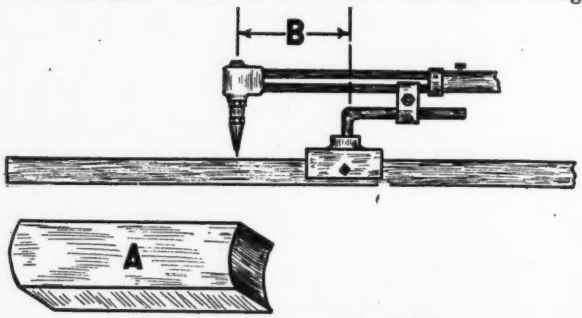
8-30

inside surfaces of the punchholder and dieholder are ground accurately and the outside of the piece has been previously milled true, each piece locks accurately in position. Two die sets are used, because there are six slots to be milled, four slots being 90 degrees from the other two. It is interesting to note that hardened steel guides are mounted upon the die set so that the operator is enabled to bring up his cutters to the correct position immediately.



Design of Fixture for Cutting-Torch.

A Fixture for the Cutting Torch

By R. H. KASPER

A LARGE number of pieces with one end concave and the other end convex, as at **A**, were to be made from bar stock. The ends were to be finished accurately to a specified radius. The oxy-acetylene cutting torch was chosen as the tool for rough cutting the parts quickly. As time could only be saved by cutting the parts approximately to shape on the ends before machining, the attachment shown in the illustration was made for the torch. A clamp holds an L-shaped piece of round stock to the lower tube of the torch. The short foot of this piece swivels in a hole in a block which is set-screwed to the bar and moved along as each piece is cut off. The radius of the arc is controlled by the distance **B**. Incidentally, it was found that the saving of material due to cutting the pieces on the required arc was considerable.

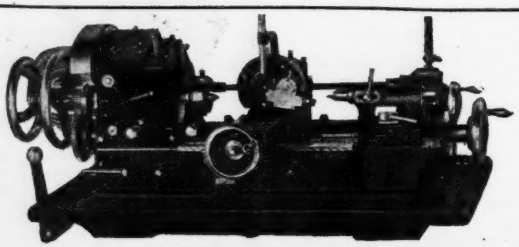
Come to Headquarters for
Grooved
(Cast Iron)
Pulleys

All Size Holes

Pulley Diam. inches	Size of Holes inches
2½	¾ ½ ⅝
3	½ ⅝
4L.	⅝ ½
4	½ ⅝ ¾ 1
5	½ ⅝ ¾ 1
6	½ ⅝ ¾ 1
8	½ ⅝ ¾ 1
10	½ ⅝ ¾ 1
12	½ ⅝ ¾ 1

Special Holes Bored

Mfd. By **EFFICIENT MACHINE SHOP** 147 Baxter St. New York City



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Machines for Thread Milling; Pinion and Gear Cutting; Cutters for these machines; Sub-press Dies.

WALTHAM THREAD MILLER for RELIEVED THREADS—MOTOR DRIVE IF DESIRED

Where **Speed** *and* **Accuracy** *are considered*

Hutto Model "MD" Machine

HUTTO Cylinder Grinders and Machines Are Specified

THE keynote of present-day machine shop production is speed with accuracy. The Hutto Process of Cylinder Grinding presents a means by which cylindrical bores may be quickly finished to precision limits within .0005".

There are Hutto machines suited to handle bores of any length and diameters from ¾" to 60".

May we help you solve your grinding problems? Our Engineering Department will be glad to advise you.

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Over the Editor's Desk

The Small Shop

DURING a recent discussion between officials of several large Eastern firms, the fact was brought out that a number of well-known tool manufacturers have adopted a policy of concentrating their sales efforts on the smaller shops. The reason for this, as one manufacturer puts it, is that they "are beginning to realize that there is a big vacuum below the so-called high-powered buying market." In the effort to leave no stone unturned to develop business, during the past several months, they have discovered that there is a large number of small concerns who are doing a good business while the high-production plants are in a slump and retrenching. In the rush to serve the big buying units, when times are prosperous and business is good, many manufacturers forget the little fellow and then when a slump comes and the big firms cease buying, these manufacturers are left high and dry with no markets in sight. On the other hand, those who are specializing on the small shops instead of tying up their production for the benefit of a few large concerns are going merrily on, maintaining an even flow of production and doing a lucrative business in the face of business depression and retrenchment.

The small firm necessarily buys and sells in smaller lots, but it is not without advantages. Bennet Chapple, Vice President of the American Rolling Mills Company—one of this country's great industries—said in a recent interview: "Small industries are alarmed by the gigantic mergers that are taking place, but is the fear justified? There will always be a place for the small industry, because by its very size it can respond quickly to the changing needs of the industrial world. Alive, alert, and trained to a quick get-away in the race for markets, there will always be a place for the thoroughbred. The world is looking constantly for the newer things offered by creative genius, either in science, mechanics, or merchandising. * * * On every side we see a steady growth of highly specialized, successful small concerns who have the time and inclination to translate the ever-widening results of research into specialty machinery and specialty products. There can be no stymie to brains—and the progress of the world will always come from individual effort rather than from mass production."

Clear Sailing Ahead

RECENT inquiries made in various parts of the country—both East and West—disclose a growing feeling that September will see an upturn in business conditions. The East is always a little more sensitive to the trend of conditions than the central and western parts of the country, and a number of eastern plants have been found tooling up for the anticipated revival in business.

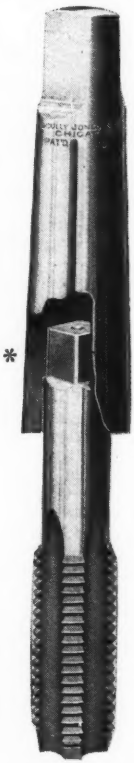
It is a familiar fact that consumption in time of depression does not fall off as rapidly as production, consequently surplus stocks are usually depleted, at such a time, to a point that fosters abnormal production when the wheels begin to turn again. A check-up will show that actual shortages exist in many lines now, and by the time industry gets under full steam again, the shortage will be acute. The time for action is here; lay in your supplies and do your tooling-up now!

"Scully-Jones" Tap Chucks

For

TAPS, DRILLS, REAMERS, WOODRUFF KEYWAY CUTTERS, END MILLS, Etc.

"Drive by the square—center by the shank"



*Section removed to show position of tap in chuck.

TOOL ECONOMY

The Positive Drive reduces tool breakage.

Taps run true and cut uniformly, therefore, last longer.

PRODUCTION ECONOMY

Quick machine set up and tool changes: Simply insert tools in chucks, then into machine spindle. No fussing with jaw chucks, nor hunting of lost chuck keys. The rigid, non-slipping drive and smooth cutting action produce a better thread with **greater speed.**

Use on **multiple spindle machines** for close center drilling, reaming and tapping

DETAILED specifications in our late Small Tool Catalog No. 37, just off the press, which describes our complete line of "WEAR-EVER" PRODUCTION TOOLS, will be gladly sent on request.

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NEW YORK CITY ..... L. C. Biglow & Co., Inc., 250 West 54th Street

New Shop Equipment

National-Cleveland Universal Gear Shaper

A gear shaper so designed that both spur and spiral gears can be cut with the same straight tooth cutter has been developed by the National Tool Company, Madison Avenue and West 112th Street, Cleveland, Ohio. By adjusting the work holding head, the same cutter can be used to cut spur or spiral gears of any helical angle, either right or left hand. The diametral pitch and pressure angle in the resulting spur gear equals that of the cutter, while the normal diametral pitch and normal pressure angle in the resulting helical gear, regardless of its helical angle, also equals that of the cutter. The method involved in the operation of the Universal Gear Shaper and its double generating principle of action is illustrated in Fig. 2, in which the gear is shown above the cutter as indicated at **A**. **B** indicates the cutter in the position it occupies before it begins to generate the teeth in the blank. The gear **A** rotates in the direction indicated by the arrow **C**, while the cutter **B** rotates in the direction of the arrow **D**, in intermeshing relation, which they would have if intermeshing with the teeth of the imaginary rack **E**, the imaginary rack simultaneously moving in the direction indicated by the arrow **F**. The cutter **B** is reciprocated across the face of the gear blank **A** in the direction of the arrow **G**, across the face of the gear, from the position shown in dotted lines to the position shown in full lines. The cutter **B** on its return stroke is withdrawn from contact with the work.

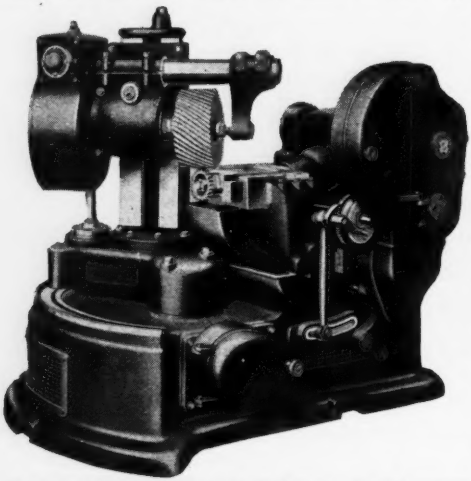
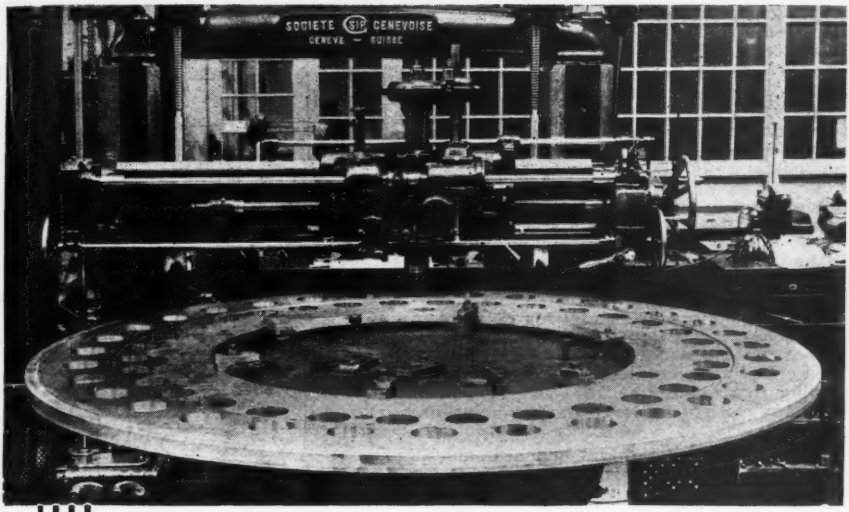


Fig. 1—National-Cleveland Universal Gear Shaper.

During the movement of the cutter in the direction of the arrow **G**, the gear blank **A** and cutter **B** revolve many times; hence during the time required for the cutter to move transversely across the face of the gear, from the position shown in dotted lines to its approximate position as shown in full lines, the teeth in the gear will have been fully generated. The actual cutting of the teeth progresses simultaneously across the full width of the face of the gear and entirely around its circumference, the cutter cutting deeper into the gear as the point of tangency is approached between the desired pitch circle of the gear and the actual pitch circle of the cutter. At the end of each return stroke, the cutter is slowly intermittently moved in the direction of the arrow **G**.

Identically the same principle of operation is followed in cutting the teeth of helical gears. It is only necessary to either angularly position the cutter axis with respect to the gear blank axis, or angularly position the gear blank axis with respect to the cutter axis, to produce helical gear teeth. The adjustment referred to is illustrated in Fig. 3. The manufacturer of the machine prefers adjusting the gear blank axis to the angle of helix, and if the same spur gear shaper cutter as that shown in Fig. 2 is used, the tooth element of the normal plane of the helical gear produced by that cutter will equal the tooth element of the cutter in its plane of revolution. The principle of action and method are the same in cutting right hand or left hand



Boring a Big Drill Jig . . .

HERE is an interesting job which proves the efficiency of the Swiss Jig Borer and shows the close accuracy limits to which it is held.

The illustration shows an MP-6 machine at the Skoda Works, Pilsen, boring sixty-four holes 4⅛" diameter and four holes 1⅞" diameter in a steel drill jig 9' outside diameter by 2¼" thick.

Accurate spacing of these holes is essential! The limit of error between any two holes is only 0.002". The Swiss Jig Borer maintains this accuracy and completes the job (floor-to-floor) in only 66 hours. Compare this time, and the accuracy obtained, with any other method.

There's a Swiss Jig Borer for all classes of work. Seven sizes represent a range from Diesel engine work down to fine instrument and watch making.

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SWISS JIG BORERS

helical gears as the principle and method described for cutting the spur gear, as illustrated in Fig. 2.

The action of the cutter when cutting helical gears is similar to the cutting action when cutting spur gears with the exception that the cutting begins all around one edge of the circumference of the helical gear and the space becomes progressively deeper and wider gradually moving across the face of the gear as the cut continues. The gear blank may be easily, quickly, and accurately adjusted to the desired helix angle for right hand or left hand helical gears, and may be as easily and accurately adjusted to zero, the position it would occupy for cutting spur gears. The adjustment is accomplished by means of a turret carrying the work slide which has a vernier scale reading in five minutes of a degree cooperating with a scale graduated in degrees.

Either right or left hand helical gears up to 45 degrees angle may be cut with the same straight tooth Universal Gear Shaper cutter. By the use of a special work slide, right or left hand helical gears of angles greater than 45 degrees, including the extremely high helical angles of single or multiple threaded worms

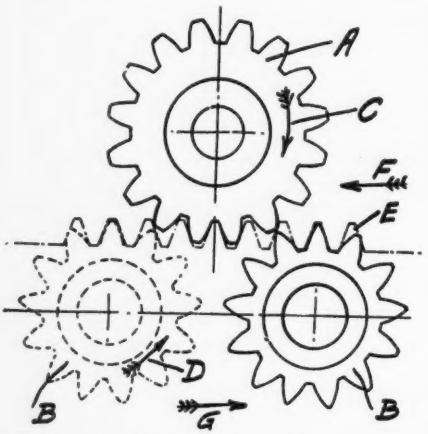

Fig. 2—Drawing showing double generating principle of action of Universal Gear Shaper.

of the cylindrical form and worms of the hour glass form, may be cut with the straight tooth Universal Gear Shaper cutter. By using a special work slide, a special helical cutter together with special helical cutter guides, and a special work slide automatic feed mechanism, hollow-faced worm wheels of high helix angles of 30 degrees and greater can be cut.

The machine is made in four sizes—12-in., 18-in., 36-in., and 72-in., to cut ex-

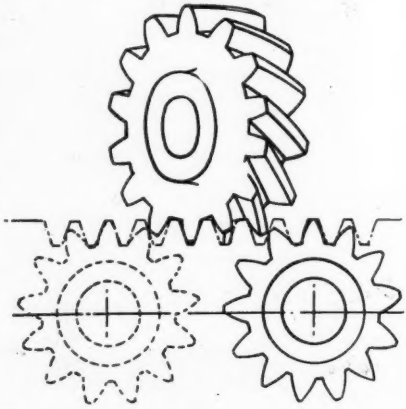

Fig. 3—The same straight tooth Universal Gear Shaper cutter may be used for cutting spur gears for right or left hand helical gears.

ternal spur and helical gears up to the pitch diameters indicated by the sizes. The maximum pitch for external spur and helical gears ranges from 5 to 1 and the pitch diameters of the cutters range from 3 in. to 12 in. Five cutter speeds are obtainable in geometrical progression. On the 18-in. machine the cutter will make one complete turn in 30 seconds, one min., 2 min., 4 min., or 8 min., as desired. The cutter reciprocations are 70 strokes per minute; 140, 280, 560, and 1120 strokes per minute.

Gallmeyer & Livingston No. 2 Hydraulic-Driven Surface Grinder

The larger sizes of surface grinders equipped with hydraulic table feeds as made by the Gallmeyer & Livingston Company, 348 Straight Avenue, S. W., Grand Rapids, Michigan, have been so successful that this firm has brought out a smaller machine of similar design, as shown in the illustration. The working surface of the table of this machine, which is known as the No. 2 size, is 6 x 18 in. The outstanding feature of the machine is, of course, the hydraulic drive to the table. By moving a control lever

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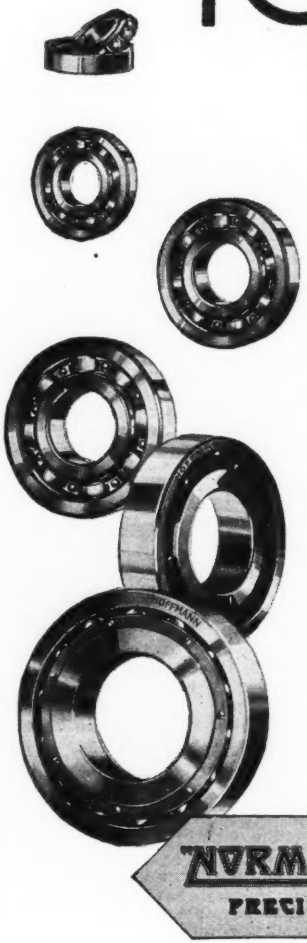

SPEED

Run over the entire range of bearing conditions—at one extreme, tremendous loads with low or moderate speeds—at the other extreme, tremendous speeds, with light or moderate loads—and, in between, all sorts of load and speed combinations, shock, vibration, variable loadings.

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In the entire range of anti-friction bearing service, there is not a set of conditions which cannot be met with NORMA-HOFFMANN Precision Bearings—economically, and with every assurance of satisfaction.

Let Norma-Hoffmann Engineers assist you in selecting the right bearing for your conditions. Their long experience is at your service—without obligation. Write for catalogs.

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PRECISION BEARINGS

NORMA-HOFFMANN BEARINGS CORPN.-STAMFORD CONN.

at the front of the machine, an infinite variation in speeds can be obtained from zero to 60 ft. or more per minute. The cross feed can be varied from .010 to .125 in. and this can be made to operate at either end of the stroke or at both ends of the stroke as desired. The cross feed is also operated hydraulically.

When the automatic hydraulic feed is

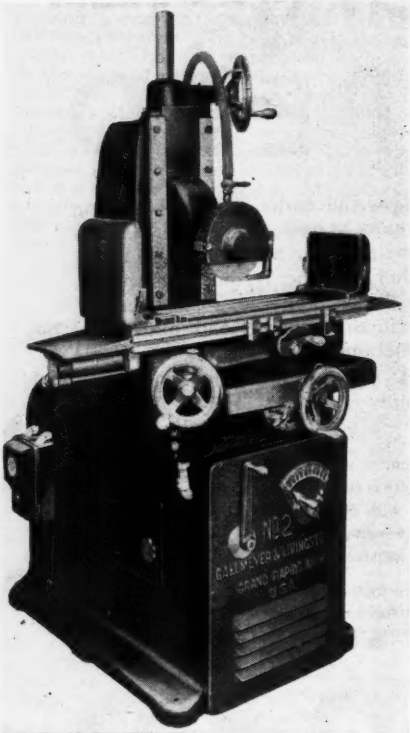


Fig. 1—Gallmeyer & Livingston No. 2 Hydraulically-Driven Surface Grinder.

in operation the hand wheel and pinion for hand operation of the table are entirely disengaged so that the smooth power of the hydraulic drive is not impaired. When the machine is to be operated by hand, the piston rod connection to the table is disconnected so that the hand movement has no drag upon it and power is applied by a spiral pinion provided for maximum smoothness of hand operation. The table movement is started and stopped by means of a crank handle at the left front.

The base is an especially heavy casting, the base and upright ways of the head being cast in one piece to insure maximum rigidity and permanence of alignment between the spindle bearings and control valve and the oil tank with its supply of oil. The head ways are carefully protected from dust and dirt to prevent sticking. The elevating screw is centrally located between the ways, eliminating any cramping action sideways, and the weight of the head to the rear of the ways plus the weight of the idler jack which is transmitted to the head by the down-pull of the belt is almost exactly the same as the weight of the head forward of the ways, which eliminates any cramping action from front to back.

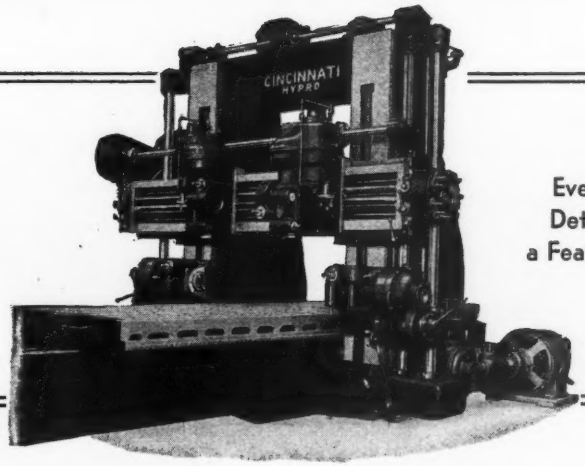
The machine is shown arranged for wet grinding but with the front and rear table splash guard removed to show the working surface of the table. The machine can be furnished for dry grinding and with a dust collecting system if desired. The standard size of wheel carried is 8 in. diameter by ½ in. face, but the spindle is sufficiently large and rigid so that variations from standard are feasible. The machine has a capacity for grinding work 9½ in. thick under the standard 8-in. wheel. A cross feed of 6½ in. is provided so that a wheel ½ in. wide will clear the working surface of the table on both sides.

Fellows Gear Shaper With 3-Inch Stroke

By limiting the cutting stroke on the 6A-type Fellows Gear Shaper to 3 instead of 5 inches, it has been possible to eliminate the customary cutter-slide and use a one-piece cutter-spindle somewhat similar in design to that used in the Fellows High Speed Gear Shaper. This change in design has increased the productive capacity of the 6A-type Gear Shaper in that it makes possible the use of coarser feeds and higher reciprocating speeds.

One of the new saddles, dismantled, is shown in Fig. 2. It can be seen that the cutter spindle is made from a one-piece forging with guides attached. The spindle is made hollow to reduce weight and the counterbalance spring is completely enclosed in the spindle. This design makes possible the use of a longer spring working under tension rather than compression, and as a spring practically twice as long as that used on the 5-in. stroke machine can be employed, the life of the spring should be materially increased.

Another noteworthy feature is the drive. The cutter-spindle is provided



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a Feature!

A Smooth Flow of Power...

. . . . delivered to the cutter is the first requirement of a planer type miller, to obtain good results.

That is why both the vertical feed and the two transverse milling heads on the CINCINNATI HYPRO PLANER TYPE MILLER are operated through a hardened and ground worm and a bronze worm wheel. It delivers an unusually smooth flow of power to the cutters at any speed, insuring finer finishes.

Let Hypro Engineers send you the details of this feature and many other features of the Cincinnati Hypro Planer Type Miller.

OTHER FEATURES:

Complete Electric Control

Independent Rapid Traverse to All Heads

Independent Power Feed to All Heads, Rail and Table

75 Feed and Spindle Speeds.

THE CINCINNATI PLANER CO.

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with a cylindrical rack and meshing with this rack is an "enveloping" pinion provided with two integral keys. Key shearing is therefore eliminated and a

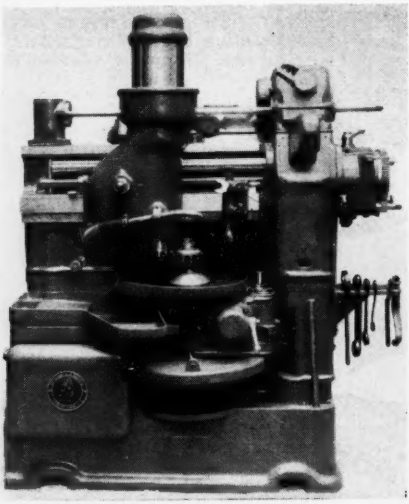


Fig. 1—Fellows Gear Shaper with 3-in. stroke.

steady and positive drive for the cutter is assured. Aside from the decrease in stroke length, the capacity of this machine remains the same as the regular 6A-type machine, which is 18 inches pitch diameter, either external or internal, and

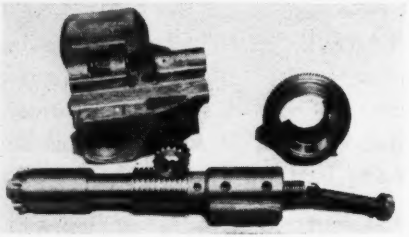


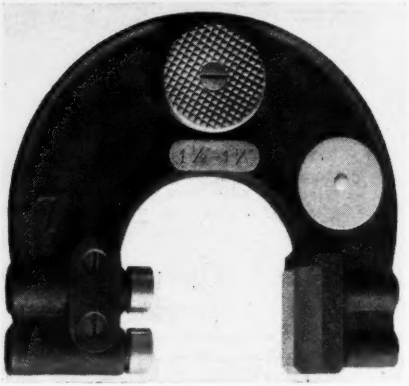
Fig. 2—New type of saddle, dismantled.

4 diametral pitch. The machine is built by The Fellows Gear Shaper Company, 78 River Street, Springfield, Vt.

Swedish Gage Co. Adjustable Limit Snap Gage

The Swedish Gage Company of America, 7310 Woodward Avenue, Detroit, Michigan, has augmented its line by the addition of the adjustable limit snap gage shown in the illustration. The tool is made in Eskilstuna, Sweden, and is sold and serviced in North America by the Detroit company. The gage has a cast iron frame equipped with an aluminum disc for marking the working limits, and is said to be both light and rigid. The grip is of pressed steel, knurled and concave, the two halves being insulated from the frame by a cushion of dead air retained by fiber washers.

One end of the frame has a solid, non-adjustable flat tool steel anvil, lapped parallel with the two adjustable tool steel gaging plugs on the opposite end, which are hardened and ground to a snug sliding fit in the frame. The plugs and anvil are beveled to aid the operator in sliding the gage onto the work without



Swedish Gage Co. adjustable limit snap gage.

marring delicate surfaces. The gaging plugs are not threaded and do not turn in the frame. They can be moved endwise only, and are adjusted by means of fine-threaded adjusting screws, slotted for a screw-driver and readily sealed to prevent tampering. Once adjusted, the plugs are clamped in place by means of a positive wedge-lock, the action of which is guaranteed by the manufacturers.

Federal Model 341 Bench Wire Gage

A bench-type gage for measuring all kinds of small wire to tolerances of .0001 in. has been developed by the Federal Products Corporation, Providence, R. I. The indicator dial is graduated by ten-thousandths of an inch, each numeral on the dial representing .001 inch. The indicator can be swiveled on the bracket

YEARS AHEAD

Hamilton Drawing-Reference Table No. 239-A

A new development in drawing tables, that speeds up work in the drafting room, increases efficiency, eliminates lost motion, and embodies the latest and most modern ideas in drawing table design and drafting room practice.

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Please send me Circular No. 42-MS.

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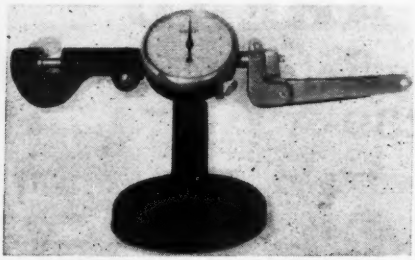
so as to bring it in direct line with the vision of the operator. In operation, the lever is pulled down to open the anvils,



Federal Model 341 Bench Wire Gage.

then the wire is drawn through and readings are taken at any point along the wire. A guide—the small metal piece at the back of the anvils—is provided so that the wire will always be central between the anvils. The frame and anvil-carrying block are highly finished in black. All other exposed parts, including the rack of the indicator, are chromium plated.

New Cincinnati Hydromatic Milling Machines

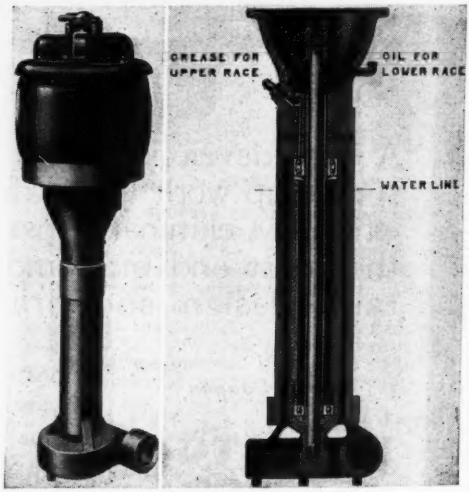
The Cincinnati Milling Machine Company, Cincinnati, Ohio, has recently added to its line of production type millers seven more sizes of Hydromatic Millers in both the Plain and Duplex styles, making a total of 18 Plain and 18 Duplex. This gives a range of machines having a table travel of 24 inches to 90 inches with a rating of from 5 to 20 horsepower, with a variety of combinations in-between which makes it possible to obtain a machine with a long table travel having a low horsepower rating.

The characteristics of the entire new line are the same as the regular standard Cincinnati Hydromatics. Summarized, they include heavy ribbing with ample room for chip disposal, Cincinnati locked hydraulic table feed, automatic dog-controlled intermittent table feed, power quick traverse of 220 in. or 300 in., depending upon the size of machine, enclosed motor drive, anti-friction bearings throughout the spindle drive with double mounting on the front and rear of the spindle, only four gear contacts in the drive, spindle reverse, cross and vertical adjustments of the spindle, Cincinnati Rectangular Overarm, centralized control at the left front side of the machine, and automatic spindle stop.

The Plain Machine is supplied with the one-way or two-way table feed cycle while the Duplex Machine is supplied with only the one-way cycle. The variable feed attachment and positive stop and delayed trip mechanism can also be supplied with either of the machines.

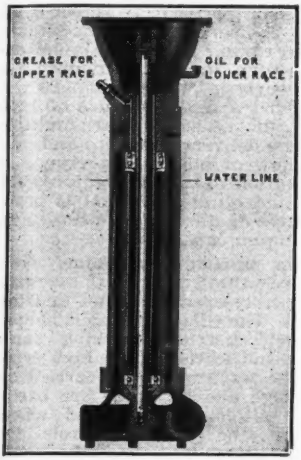
Brownie Coolant Pump

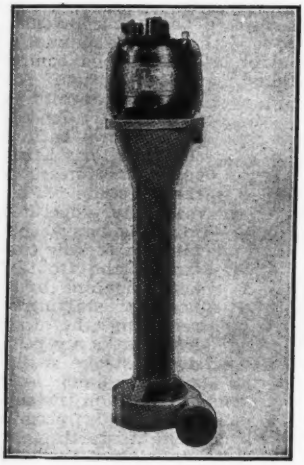
A vertical-type, centrifugal pump, especially designed for use with machine tools where a heavy flow of coolant or cutting oil is desired, has been released to the market by the Tomkins-Johnson Company, Jackson, Michigan. The pump uses no packings and is said to be trouble-proof, with no possibility of clogging. It is simple in design and unusually sturdy in construction, having a capacity of 50 gallons per minute with a maximum lift of 15 feet. The pump is powered by a ¼-h. p. motor, operating at a



(Left)—Brownie Coolant Pump. (Right)—Cut away View Showing Mechanism.

speed of 1725 r.p.m. The height overall is 19⅝ inches, including the motor, and the pump can be placed in an





BROWNIE COOLANT PUMP

Simple :: Sturdy :: Efficient

A Trouble-Proof Coolant Pump!

THIS improved Brownie Coolant Pump is especially adaptable for centerless grinders. A centrifugal pump, it uses no packings and will not clog. No bottom or pan under impellor to collect grit or chips. Drive shaft, impellor and protector tube are one unit, revolving together. With intake at top, coolant is never forced upward between housing and protector tube, and never comes in contact with ball bearings (the latter being entirely self-aligning).

No. 1 has a capacity of 50 gallons per minute with a maximum lift of 15 feet, a ½ H. P. motor, used with direct motor drive, which is changeable, and a speed of 1725 R.P.M. The height over all is 19⅝" (which is changeable) including motor and pump can be placed in a 8½" diameter circle. Outlet pipe is 1¼".

No. 2 pump has a capacity of 15 gallons per minute; a maximum lift of 10 feet; a ¼ H. P. motor; a 1" outlet pipe; height, 19⅛" (which can be changed) including motor.

This pump handles a heavy mixture of coolant with grit and chips as efficiently as it does clean oil. Furnished with or without motor, or with driving pulley, if desired. It can also be furnished in acid-resisting metal.

We also manufacture: Hopkins 3- and 2-jaw pneumatic chucks; Series B and C pneumatic air cylinders; tubular type, non-rotating, double-acting air cylinders; collet chucks; coolant pumps; die sinking milling cutters; and special equipment.

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- ☐ Pneumatic Chucks
- ☐ Air Cylinders
- ☐ Tubular Type Air Cylinders
- ☐ Collet Chucks
- ☐ Arbor Presses
- ☐ Die Sinking Milling Cutters

Name..... City.....

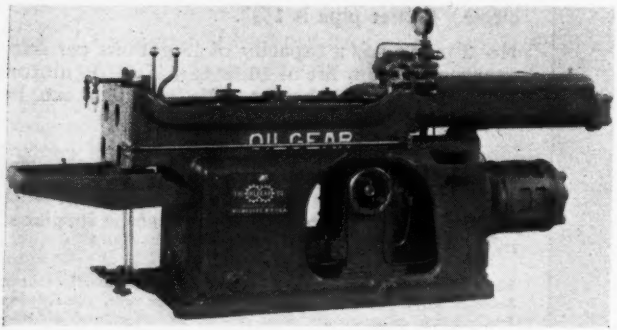
Address..... State.....

8½-in. diameter circle. The outlet pipe is 1¼ inches in diameter.

The drive shaft impeller and protector tube are one unit, revolving together, and there is no bottom or pan under the impeller to collect grit or chips. With the intake at the top, the coolant is never forced upward between the housing and protector tube and never comes in contact with the ball bearing. The latter is within one inch of the impeller, which is self-aligning. The pump handles a heavy mixture of coolant with grit or chips as easily as it does clean oil. It will be furnished with or without motor, or with driving pulley, if desired, and can be furnished made from acid-resisting metal.

Oilgear Twin Twelve Horizontal Broaching Machine

The Oilgear Company, 661 Park Street, Milwaukee, Wisconsin, announces the new Twin Twelve horizontal broaching machine. This machine differs considerably in construction from the Twin Ten broaching machine, which it supersedes.



Oilgear "Twin Twelve" Horizontal Broaching Machine.

Sturdy construction, convenient control, higher pulling and return speeds, and closer limits for finished parts have been the keynote of this broaching machine design. The Twin Twelve Broaching Machine is adapted for high speed broaching of small and medium size parts, especially those used in the automotive and aeroplane industry.

The Oilgear Twin Twelve broaching machine power unit consists of an Oilgear type "WG-6" variable delivery pump which is mounted in the frame as an integral part of the machine. The efficiency of the Oilgear pump at full stroke and load is said to be 90 per cent. The pump is operated at a maximum speed of 860 r.p.m., has a maximum delivery of 4,800 cu. in. of oil per min. at a maximum working pressure of 1,000 lb. per sq. in. and a peak pressure of 1,250 lb. per sq. in. The Oilgear multiple plunger pump delivers a smooth and pulsationless flow of oil under pressure in direct proportion to the pull required for broaching, and oil displacement is practically positive against any resistance up to the maximum capacity.

The pump, broaching machine, work and tools are protected against overload by automatically-operated relief and bypass valves. The Oilgear pump is simple and compact, and the working parts have flooded lubrication under high pressure. All heavy thrusts are carried on roller bearings and all parts are easily accessible. A convenient hand wheel mounted on the pump controls the amount of oil delivered and the speed of the draw heads.

The Twin Twelve broaching machine can be equipped with a simple manually-operated control or a combined control for automatic or manual operation. The broach control is conveniently located and allows both of the operator's hands to be free to serve the machine. The manually-operated machine has a double foot treadle control at the front of the machine to be used for starting or reversing the draw heads at any point of the stroke. A convenient hand lever mounted on the control rod also permits instant starting and stopping of the draw heads. An adjustable cam automatically stops the draw heads at the end of the stroke. The stroke of the draw heads can be easily changed to suit the work and tools, and can be made continuous in operation.

The draw heads are screwed onto the rams and are guided by "Ampco" bronze liners on large hardened steel flat ways. The draw heads can be adjusted 1¼ in. above or below the centerline of the ram. The frame provides a large reservoir for the coolant supply. A belt-driven gear pump delivers 14 gallons of coolant per minute to the broaching tools.

The general specifications are: normal

QUICK SERVICE ON FORMICA GEARS

Most of the gear cutters named below carry Formica sheet in stock and can give you quick service.

The Akron Gear & En'g Co.
Akron, Ohio

Slaysman & Company
Baltimore, Md.

Harry A. Moore
Bangor, Me.

The Union Gear & Mch. Co.
Boston, Mass.

The Atlantic Gear Works
Brooklyn, N. Y.

Chicago Rawhide Mfg. Co.
Chicago, Ill.

Perfection Gear Company
Chicago, Ill.

Chicago Gear Company
Chicago, Ill.

Columbus Gear Co.
Columbus, Ohio

The Cincinnati Gear Co.
Cincinnati, Ohio

The Greaves Mch. Tool Co.
Cincinnati, Ohio

The Horsburgh & Scott Co.
Cleveland, Ohio

The Stahl Gear & Machine Co.
Cleveland, Ohio

Jansen Machine Works
Des Moines, Ia.

The Ferguson Gear Co.
Gastonia, N. C.

Excello Machine Co.
Grand Rapids, Mich.

Hartford Special Mchny. Co.
Hartford, Conn.

Perkins Machine and Gear Co.
Hartford, Conn.

Joaquin Alemany Lopez
Havana, Cuba

Kreiter Gear & Machine Co.
Houston, Tex.

Dedman Foundry & Mch. Co.
Houston, Tex.

The Keystone Engineering Co.
Los Angeles, Cal.

The Generating Gear Co.
Milwaukee, Wis.

Mobile Pulley & Machine Works
Mobile, Ala.

Gerdes & Co.
New York City

Berkley Machine Works & Foundry Co.
Norfolk, Va.

Paragon Manufacturing Co.
Newark, N. J.

E. M. Smith Machine Shop
Peoria, Ill.

The Earle Gear & Mch. Co.
Philadelphia, Pa.

The Pittsburgh Machine & Supply Co.
Pittsburgh, Pa.

Standard Gear Co.
Pittsburgh, Pa.

Simond's Mfg. Co.
Pittsburgh, Pa.

Rodney Davis and Sons
Philadelphia, Pa.

The Turley Gear & Mch. Co.
St. Louis, Mo.

Perkins Machine & Gear Co.
Springfield, Mass.

Winfield H. Smith, Inc.
Springville, N. Y.

Alling Lander Company
Sodus, N. Y.

Charles E. Crofoot Gear Corp'n
South Easton, Mass.

Arlington Machine Co.
St. Paul, Minn.

Worcester Gear Works
Worcester, Mass.

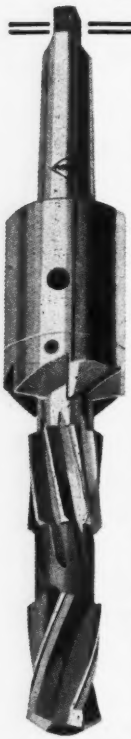
Massachusetts Gear & Tool Co.
Woburn, Mass.

THE FORMICA INSULATION COMPANY

4632 SPRING GROVE AVENUE CINCINNATI, OHIO

FORMICA

SAVE LABOR
WITH
MIDWEST
TOOLS



THE most expensive item in production is labor — save labor and you cut costs! The MIDWEST tools save labor by combining operations.

The tool illustrated combines four operations in one....it drills, reams, spot faces and chamfers.

The Midwest Pin Drive is also an outstanding feature of the Midwest tools. This drive is a solid and accurate drive which eliminates all chance of breakage, gives extra long service and enables you to work to closer limits.

Here is a method which will cut your costs....get the details....write for a catalog!

Midwest Tool & Mfg. Co.
2362 West Jefferson Ave.
DETROIT, MICH.

pulling capacity, 12,000 lb.; peak pulling capacity, 15,000 lb.; stroke is adjustable from 6 in. to 36 in., and the pulling speed is adjustable from 48 in. to 396 in. per min. Distance between drawheads, 10 in.; dia. of holes in face plate, 4 in.; distance between ways, 6 in.; vertical adjustment of crossheads, 1¼ in. above or below centerline. Floor space required, 32 x 120 in. Net wt. of motor-driven machine, approx. 4,800 pounds.

The Twin Twelve is operated by a 10 h.p. 860 r.p.m. constant speed motor equipped with mounting flange as shown on the photograph, or a standard motor mounted on a bracket attached to the rear of the machine. Special equipment adapted for this machine includes a sliding broach support with leg, broach clamping fixtures, and countershaft for belt drive.

Lufkin Direct-Indicating Micrometer

The Lufkin Rule Company, Saginaw, Michigan, has announced a distinctly new method of marking a micrometer. Referred to as a Direct Indicating Micrometer, this tool gives the total reading of the measurement at a glance. The measurement is indicated by an ingenious arrangement of figures on the sleeve. The

Lufkin Direct-Indicating Micrometer.

hub markings are the same as on the regular type of micrometers. The hundreds of thousandths are indicated by a long line, the reading shown as usual by figures 0 to 9. The three shorter lines indicate .025 in., .050 in., and .075 in., arranged so that they appear as a group of three. The sleeve is notched or cut away at the zero point so that at each revolution of the spindle a new line comes instantly into view when zero is reached. On the sleeve a row of figures from 0 to 24 is shown on the edge. A group of three rows of figures indicating 25 to 49, 50 to 74 and 75 to 99, is shown at the right, yet are so arranged in spiral form that each row follows the last without jumping over.

To read the micrometer, the operator notes on the hub the last line in view.

CONNECTICUT BROACHES

Combine Operations!

Combining operations always results in time savings and lower costs. The Connecticut combination round and spline broach obtains these results by broaching the drilled hole to size, cutting the splines, and removing the burr *in one operation*. Besides, the accuracy of the job is improved.

Investigate the possibilities of these tools in your plant. Send us a description of your job and let our engineers recommend a broach that will be guaranteed to do your job better!

The CONNECTICUT BROACH & MACHINE CO.

NEW LONDON, CONN.

Helping Industry...

PULLING the heavy loads—year in and year out—more efficiently and with less adjustments is the kind of service you get from the PULLMORE Industrial Clutch. This service helps industry to lower production costs and increase production.

The perfect balance of the PULLMORE Clutch allows it to operate at high speeds. Its good design and excellent workmanship makes the PULLMORE a high grade piece of machinery—more than just a clutch.

That's why so many well known manufacturers of high grade machine tools, laundry machinery, cranes, rubber working machinery and many others use the PULLMORE Clutch as a standard part of their product.

You, too, can solve your transmission problems with the PULLMORE Clutch. Let us show you how ... just send the details of your requirements.

Rockford Drilling Machine Company

10 Catherine St., Rockford, Ill.

If it is a long line, it is read in the edge column. If it is the first short line, it is read in the first row of figures in the group of three. If the second short line shows, the operator reads in the second row. If the third short line shows, he reads in the third row. He then prefixes to this reading the figure indicating hundreds of thousands. He then has the full reading without any calculations. The reading can be taken in the regular way and verified with the Direct Indicating feature.

C. M. & T. Grinding Attachments

The City Machine & Tool Works, East Third at June Street, Dayton, Ohio, has introduced two new grinding attachments for use in connection with their Peerless gear tooth chamfering machine. Used in conjunction with each other they furnish satisfactory means of accurately grinding Peerless Tooth Chamfering Cutters. Photograph Fig. 1 illustrates the flute-grinding fixture, which enables the accurate grinding of the flutes in Peerless tooth-rounding cutters. The cutter, which is held by a collet in front, is indexed by a ratchet spring arrangement in the rear to each successive flute position.

The photograph Fig. 2 shows the fixture which is used to grind the relief. A cam

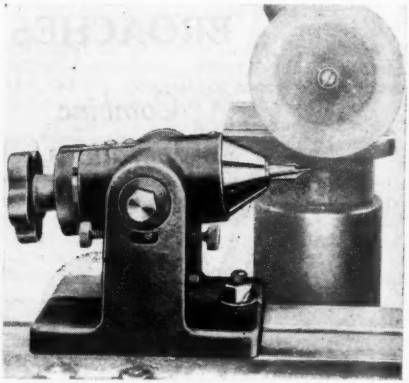
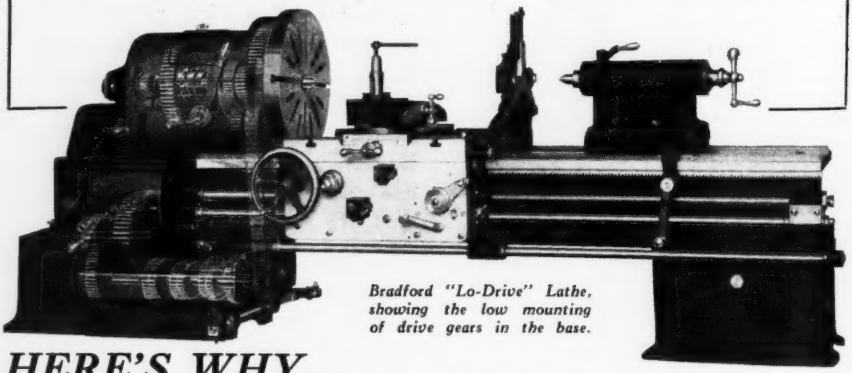


Fig. 1—C. M. & T. Flute Grinding Fixture.

arrangement is utilized so that the cutter being held in the collet moves back and forth in the exact relationship to the grinding wheel to assure the proper relief. The original set-up is made by

Bradford "Lo-Drive" Lathes Are Chatterless!



Bradford "Lo-Drive" Lathe, showing the low mounting of drive gears in the base.

HERE'S WHY.....

THE fast running drive-gears of any lathe are the vibration producers . . . and when mounted in the head, the vibration travels downward *across* the spindle!

In BRADFORD "Lo-Drive" Lathes all the fast-running drive gears are in the base . . . mounted *low* and on a *firm foundation.* All vibration is dissipated as it travels upward . . . and never reaches the spindle level.

Let us send you complete details . . . write for a bulletin.

BRADFORD MACHINE TOOL CO. 659 EVANS STREET CINCINNATI, OHIO

Lift the Heavy Loads
WITH A
UNION HOIST

UNION Chain Hoists lift heavy loads with a minimum amount of effort on the part of the operator. Less hand chain is handled to lift the load a given height. Union Hoists offer the following exclusive features:

1. Reversible Load Sprocket.
2. Handwheel shaft and driving pinion are supported beyond intermediate gears.
3. Loadwheel shaft is made of solid alloy steel supported on large roller bearings enclosed in cases.

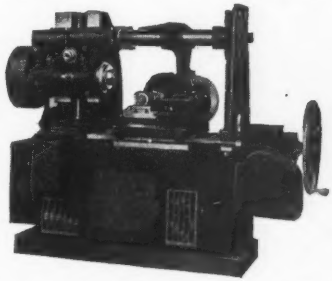
These and many other features are fully described in the Union Hoist Catalog—Send for your copy today!

Made in 12 sizes from ½ to 20 Tons

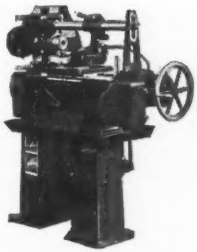
Send for the UNION CHUCK Catalog Also!

UNION MFG. CO.
NEW BRITAIN, CONN.
BRANCH OFFICES
Chicago Cincinnati New York City
San Francisco Houston, Texas

SERVICE *Is Our Motto* QUALITY *Our Creed*



HOBBING MACHINES
by
BARBER-COLMAN
of ROCKFORD



4 SIZES of Hobbing Machines . . . two sizes "universal" type for spur and spiral gears, sprockets, ratchets, splined shafts and other hobbed forms . . . two sizes for high production on spur gears and splined shafts only . . . Quality Products . . . Send for our circulars.

BARBER-COLMAN COMPANY
General Offices and Plant, *Rockford, Ill., U.S.A.*

Eclipse HIGH PRODUCTION TOOLS

The Combined Core Drill and Facer

This is No. 3 of a series of advertisements describing the ECLIPSE Line of High Production tools. Watch for others to follow.

Here is a good example of the Economy in ECLIPSE Tooling.

It is the ECLIPSE combined Core Drill and Facer which is used to great advantage for machining Welch Plug holes or for finishing in one operation holes having two or more diameters.

Some of the advantages of this tool over any others are: Longer life, greater chip clearance, cuts square shoulders, combines operations, is driven with the well-known ECLIPSE Drive.

Economize with ECLIPSE Tooling! Let us show you how . . . . send the coupon for a complete catalog.

ECLIPSE COUNTERBORE CO.
DETROIT MICH.

ECLIPSE COUNTERBORE CO.
Detroit, Michigan.

How can I economize with Eclipse Tools? Send me a catalog.

Name.....

Firm.....

Address.....

City.....State.....

placing the cutter loosely in the collet and bringing the arm A over and setting it in the cutter flute before tightening the collet. Then, after tightening the collet, the cutter is revolved by an indexing arrangement which is properly synchron-

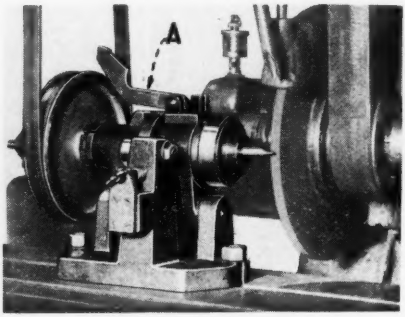


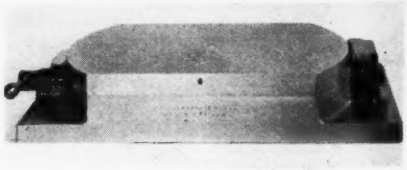
Fig. 2—Fixture for Grinding Relief.

ized with the previously described in and out motion produced by the cam mechanism.

Results from these two fixtures feature accuracy of grinding together with a minimum amount of metal removed so that not only the actual cutting performance of the cutters is greatly increased, but their life is greatly lengthened.

B. & S. Standard Index Bases

The Brown & Sharpe Mfg. Co., Providence, R. I., announces the addition of the Nos. 2 and 13 Standard Index Bases to its already extensive line ot milling machine attachments. These attachments are designed primarily for use on the Brown & Sharpe plain milling ma-



B. & S. No. 2 Std. Index Base.

chines which have automatic semi-automatic table movements. The bases are similar in design and operation, consisting of a heavy base, bolted to the table of the machine, on which is mounted a swivel. The swivel rotates on a heavy pivot and is locked rigidly in position by a taper plunger operated

Exposed view of the Herringbone Gear Drive and Spindle Assembly of the MITCHELL Motor Driven Polishing Lathe.

The Inside Story

of the

MITCHELL

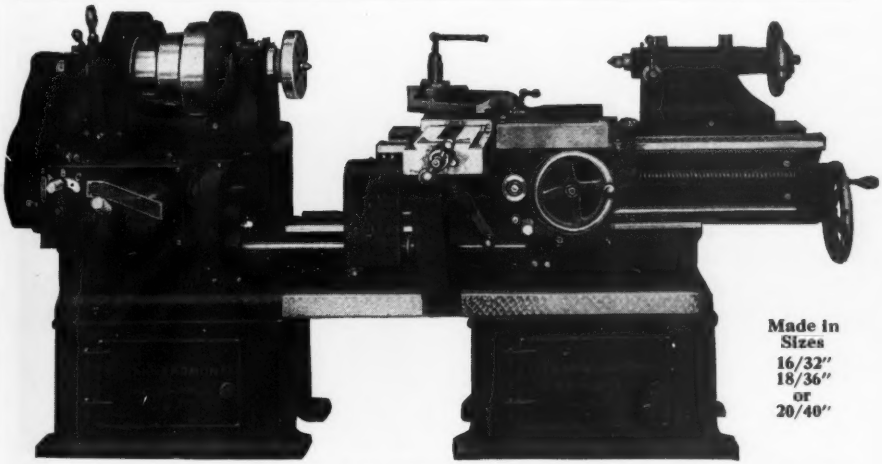
HERRINGBONE GEAR DRIVE...

....is best told by a careful study of the above illustration.

This illustration shows how the various Mitchell features are obtained with the Herringbone Gear Drive.... and how rigidly and accurately the machine is constructed to give you years of efficient service.

Investigate the advantages of the Mitchell Motor Driven Polishing Machine with Herringbone Gear Drive. WRITE FOR A BULLETIN!

THE MITCHELL ENGINEERING CO.
SPRINGFIELD OHIO



Made in Sizes
16/32"
18/36"
or
20/40"

Rahn-Larmon 18/36" Extension Bed Gap Lathe

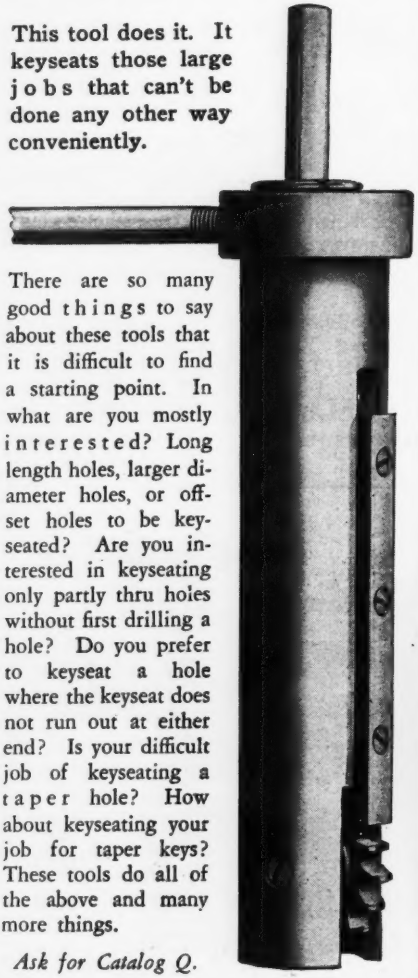
A lathe for large or small swing work, ready at all times. Requires no extra rigging up. Takes different distances between centers.

Belt driven or with nine speed all geared motor driven head. Tell us what your requirements are and let us quote you.

THE RAHN-LARMON CO. 2935 Spring Grove Ave., Cincinnati, Ohio

KEYSEATING KEYSEATING

This tool does it. It keyseats those large jobs that can't be done any other way conveniently.



There are so many good things to say about these tools that it is difficult to find a starting point. In what are you mostly interested? Long length holes, larger diameter holes, or offset holes to be keyseated? Are you interested in keyseating only partly thru holes without first drilling a hole? Do you prefer to keyseat a hole where the keyseat does not run out at either end? Is your difficult job of keyseating a taper hole? How about keyseating your job for taper keys? These tools do all of the above and many more things.

Ask for Catalog Q.

National Machine Tool Co.

2271 Spring Grove Avenue

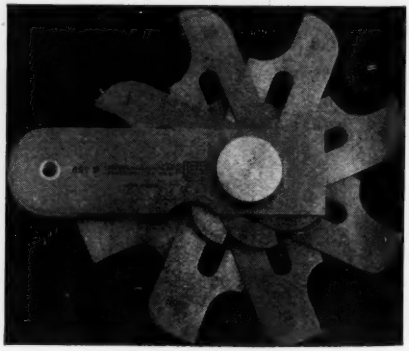
CINCINNATI, OHIO, U. S. A.

by a hand lever. It can be indexed through 360 degrees, with working positions at 0 and at 180 degrees. The contact surfaces are scraped, assuring correct alignment and rigidity. Various types of fixtures, both regular and special, are adaptable for use with this attachment.

Both sizes of B. & S. index bases are furnished with reversible tongues for aligning them on the table of the milling machine, and a tongue slot for aligning fixtures is cut on the swivel. The index base is used to best advantage on jobs where semi-automatic table movements are used, where the loading time is equal to or greater than the cutting time. It is arranged with a fixture at each end of the swivel and while the work in one fixture is being milled, the fixture on the other end is being loaded. Upon completion of the cut, when the table returns to the loading position, the swivel is indexed to bring the fixture on the opposite end into working position, after which the machine is again set in motion. The work is then removed from the fixture on which the cut has just been made and it is reloaded preparatory to beginning the next cycle.

B. & S. Fillet & Radius Gages No. 627

Some very unique features are embodied in a series of fillet and radius gages recently announced by the Brown & Sharpe Mfg. Co. of Providence, R. I.

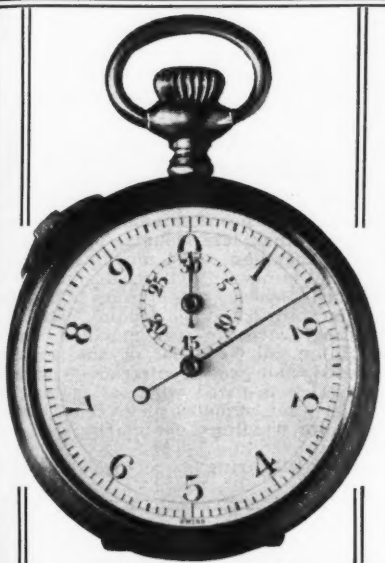


B. & S. Fillet Gage No. 627B.

The tools simplify the rapid checking of fillets and radii.

Concave and convex radii of the same size are included on the same blade, this double-ended feature reducing by one-

ACCURATE TIME



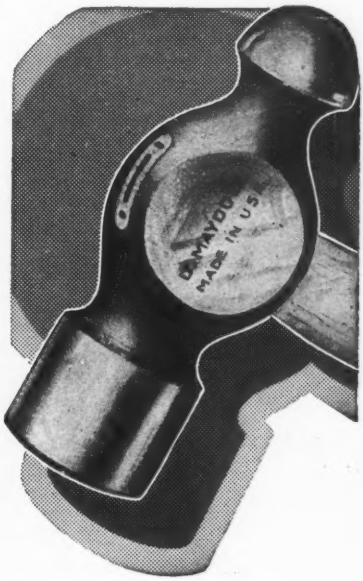
30 DAYS' FREE TRIAL

KEEN competition of modern business demands that time and task standards be accurate for every operation. Hough Precision Time Study Equipment scientifically developed by master engineers and now in use in a long list of varied industries, will give you unfailing accuracy with minimum pencil work in determining your figures. Catalog H100 will show you how this precision equipment can help solve your production problems—Write for it today.

HOUGH TIME STUDY WATCHES

AND PRECISION TIME STUDY DEVICES

THOMAS R. HOUGH ASSOCIATES
INDUSTRIAL ENGINEERS
5337 Belle Plaine Ave. Chicago



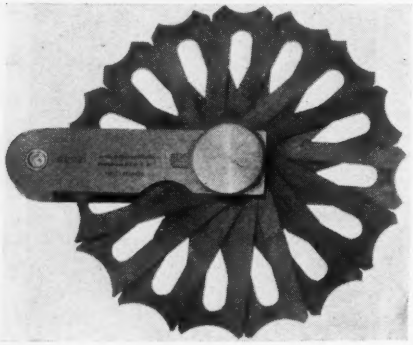
Maydole Hammers are the choice of men who know tools and like to work with good ones.

PRESS-FORGED tool steel heads, clear second growth hickory handles put into the heads "for good," built to fit your grip and swing. Your dealer carries Maydole Hammers — write us for a free copy of Pocket Handbook 23 "P" containing much useful information.

YOUR HAMMER SINCE 1843
Maydole Hammers
The David Maydole Hammer Co., Norwich, N.Y.

4193

half the number of blades necessary for a given range. The blades are long and easily used in places formerly hard to reach. They are slotted and slide easily, this slotting feature making many blades



B. & S. Radius Gage No. 627D.

available at one time. A large clamp nut locks the blades securely in any desired position. Light-weight metal is used which gives greatest possible lightness with strength.

Two styles of gages are made. The Nos. 627A and 627B have a blade which is particularly adapted for checking fillets and radii in corners or against shoulders. No. 627A has a range from 1/32 in. to 17/64 in. by 64ths and No. 627B from 9/32 in. to 33/64 in. by 64ths. The Nos. 627C and 627D are especially useful in laying out forming tools and similar work. No. 627C has a range from 1/32 in. to ¼ in. by 64ths, and No. 627D from 17/64 in. to ½ in. by 64ths.

Hammond Type "W" H. D. Grinder

The illustration shows the Type "W" 5 and 7½ h. p. capacity Heavy Duty Grinder which has been placed on the market by the Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo, Michigan. The machine is compact and is new in general design. It is intended especially for continuous production on heavy tool grinding. The outstanding feature of the machine, as in all Hammond Grinders, is the totally-enclosed 40-degree Centigrade-type motor, which is fitted with a motor air cleaner that supplies clean, cool air to the motor windings, eliminating grit and dirt.

The ball bearings, which are oversize,

LET A POWELL BLOW GUN AIR VALVE—
Blow your Turnings or Borings away
BLO-GUN

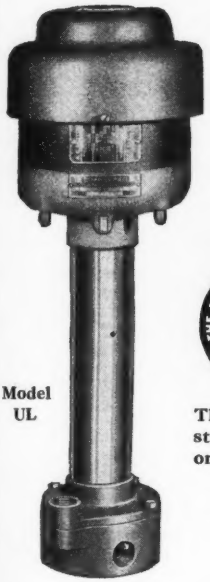
AN INTERCHANGEABLE NOZZLE TIP FOR EVERY PURPOSE—
POWELL VALVES
THE WM. POWELL CO., Cincinnati, Ohio

They Never Have To Prime

NIAGARA FALLS!

GRAVITY — nature's irresistible force — does it! Gravity primes GUSHER pumps, too, and they flow with the same unfailing certainty. For a spontaneous, uniform, copious flow of coolant, install a

GUSHER COOLANT PUMP



Model UL

This device is stamped in red on top of every genuine GUSHER.

The Ruthman Machinery Co.
532 EAST FRONT STREET
CINCINNATI, OHIO

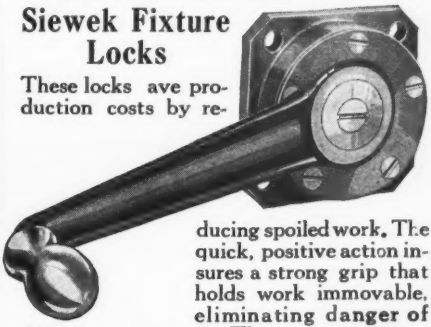
3 Siewek Tools
SERVING INDUSTRY WELL

To serve industry well, a tool must save time...energy ...or money. Siewek Tools make these savings. Take for instance:

Siewek Drill Jigs

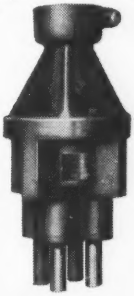
The cushion clamping of these jigs saves energy, loading time, allows closer accuracy, and increases production. They are built in nine sizes.

Siewek Fixture Locks



These locks ave production costs by reducing spoiled work. The quick, positive action insures a strong grip that holds work immovable, eliminating danger of shifting under cut. There are nine sizes.

Siewek Drill Heads

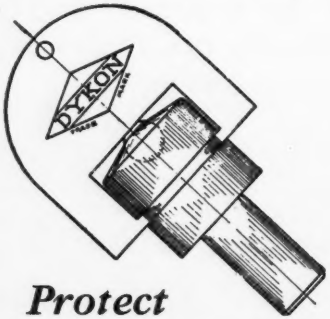


When used with Siewek Drill Jigs, these heads insure a set-up that will save time and increase production. There is a Siewek Drill head for every need.

WRITE FOR A CATALOG

Siewek Tool Co.
10232 Woodward Ave., Detroit, Mich.

DYKON GAGES



Protect

Koebel-Wagner DIAMONDS!

KOEBEL-WAGNER Diamonds are protected by the Dykon Gage against unintentional abuse. This is a small KOEBEL-WAGNER Device which indicates almost automatically when a diamond is worn to its lowest level and requires resetting.

KOEBEL-WAGNER Diamonds are also protected by a Safety-mounting against loss. This mounting prevents the stone being torn loose by the action of the grinding wheel.

Thousands of these diamonds are used daily throughout the manufacturing industry to keep precision grinding wheels smooth and true. They will cut your grinding costs and give your grinding wheels longer life. Let us show you how—send the coupon TODAY!

Koebel-Wagner Diamond Corp.

144 ORANGE ST. NEWARK, N. J.

1200 Oakman Blvd., Detroit, Mich.
310 Citizens Bldg., 850 Euclid Ave., Cleveland, Ohio
New York, Indianapolis, Chicago, San Francisco

Koebel-Wagner Diamond Corp.
144 Orange St., Newark, N. J.

How can I cut my grinding costs by using K-W Diamonds?

Name .....

Firm .....

Address .....

City.....**State**.....

are protected from dirt and dust by labyrinth seals. They have convenient oilers with oil level gage and flushing plugs, making it possible to cleanse the bearings without dismantling the machine. The spindle is of chrome nickel steel, accurately ground and balanced.

The machine is equipped with push button control and Cutler-Hammer automatic motor starter, having thermal overload protection, low voltage and phase failure protection. The automatic

Hammond Type "W" H. D. Grinder

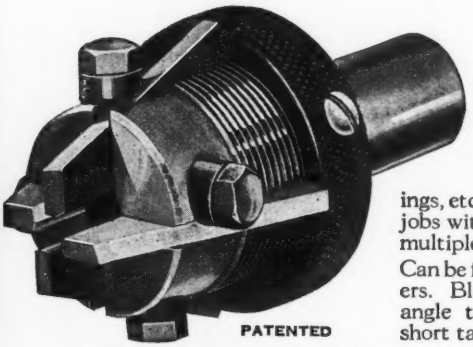
starter is mounted on the inside of the pedestal door for convenience in inspecting or resetting. The wheel guards are of boiler plate steel and comply with the American Standard Association specifications. They have hinged doors for quick removal of grinding wheels, and are equipped with spark shields and shatterless glass eye shields. The guards are adjustable and demountable tool rests are standard equipment.

Master Electric Explosion-Resisting Motor

The Master Electric Company, Dayton, Ohio, announces a new, improved type of explosion-resisting motor which is especially designed for use wherever explosive vapors are encountered, such as gasoline pumps, spray booths, dry cleaning plants, gas plants, and the manufacture of paint and varnish. Incorporated in the design of the new motor are many important features, such as high start-

Genesee Adjustable Hollow Mill

Made in 7 different styles



PATENTED

Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

A Genesee Adjustable Hollow Mill can be made for every job

WRITE FOR CATALOGUE

GENESEE MANUFACTURING CO., Inc.

ROCHESTER, NEW YORK

WHITON LATHE CHUCKS

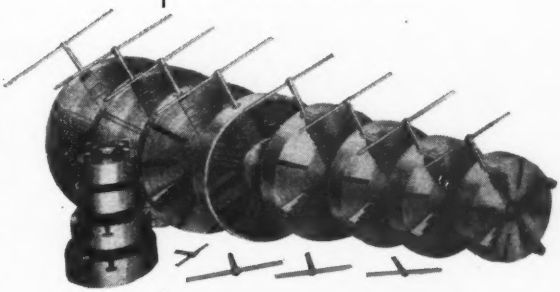
For a Sure Grip!

WHEN work must be held rigidly and securely for accurate machining at top speeds — WHITON Lathe Chucks prove their superiority!

WHITON Chucks—and there's one for every requirement—are good chucks. Their design and workmanship assure you dependable service over a long period of time.

Get a WHITON Catalog—it shows the complete line of WHITON Chucks as well as many special chucks built for special requirements.

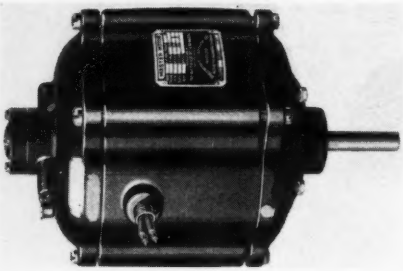
Here is a group of WHITON Steel Body Independent Chucks designed to hold heavy work under heavy cuts at high speed. The one-piece body resists sudden strain.



THE D. E. WHITON MACHINE CO.

NEW LONDON CONN.

ing torque, high overload capacity, cool running, quiet operation, vertical or horizontal mounting, large over-size bearings, liberal thrust bearing for vertical



Master Electric Explosion-Resisting Motor

types, interchangeable mounting dimensions for all frequencies and for direct current.

The interchangeable frames used on these explosion-resisting motors permit single phase, polyhase, and direct current motors of the same horsepower, speed and current rating to be installed on the same mounting. This feature means a saving in pattern costs as well as in mounting time and labor, and eliminates the necessity of having a special mounting for each different type of motor.

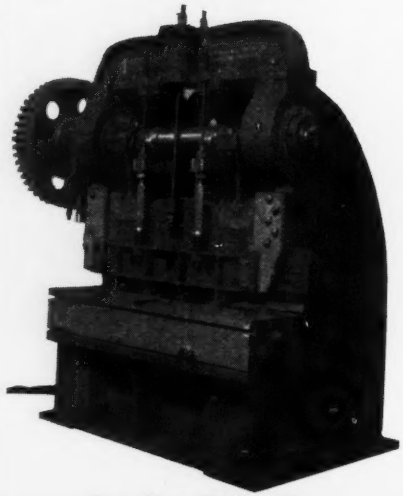
The motor is built under the supervision of the National Board of Fire Underwriters. Each motor shipped carries a regular Underwriters' name plate indicating that it has been built under the maximum supervision which the National Board of Fire Underwriters is able to give. The motor is especially compact and attractively designed and can be purchased in sizes from ⅛ to ½ h.p. inclusive.

The Master Electric Company offers the services of its engineers to design these motors to any particular application and whenever necessary the motor will be "Custom Built" to meet the special requirements of the application.

Globe Dynamic Balancing Machine

To meet the need for a simple and accurate method of dynamic balancing parts that are intended to rotate at high rates of speed, The Globe Tool & Engineering Co., Dayton, Ohio, has developed the machine shown in the illustration. The machine is said to determine

EFFICIENCY—DEPENDABILITY



Gate Shear, Medium Size

Both Prime Factors Built in

POWER PUNCHING and SHEARING

Machinery Made By

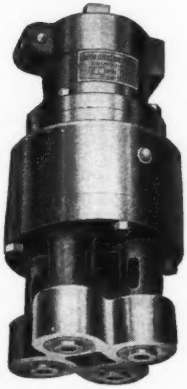
THE LONG & ALLSTATTER CO.
HAMILTON, OHIO

A superior and more complete line than ever, for perforating and cutting off metal in practically any size or shape

STEEL PRESS BRAKES
ALLIGATOR SHEARS
POWER PRESSES

4

Holes At One Time With a



U.S. DRILL HEAD

THE U. S. Drill Head changes your one-hole-at-a-time drilling machine into a multiple drill, by allowing any number of holes—fifty if necessary—to be drilled in the same time as one hole.

The particular head shown drills four holes at one time, but we make drill heads to drill any number of holes to meet your requirements.

Send us blue print of your job, and we will show you what you can save by using a U. S. Drill Head.

The United States Drill Head Co.

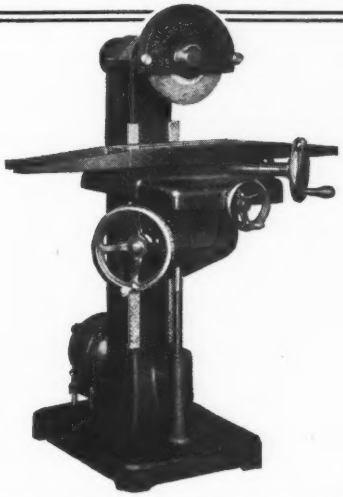
1954 Riverside Drive

Cincinnati Ohio, U. S. A.

GRAND RAPIDS

No. 1

SURFACE GRINDER



THE GRAND RAPIDS No. 1 Surface Grinder is an ideal machine for those odd jobs that are constantly coming up in the tool room. It is a fast machine, which can be easily changed from one set up to another, particularly suited for grinding small work where short longitudinal table strokes are required.

A competent operator can exceed the production possibilities of anything in the automatic surface grinder line, except the latest type of hydraulic feed machines.

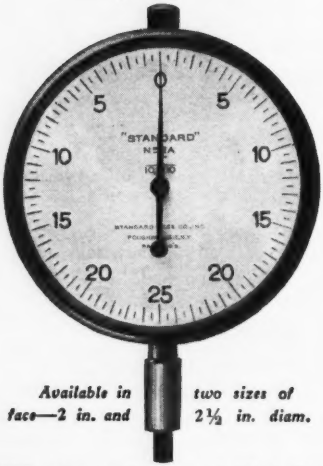
Investigate this grinder—you'll find it is a high grade hand feed precision machine. Send for a catalog TODAY!

GALLMEYER & LIVINGSTON CO.

348 Straight Ave., Grand Rapids, Mich.

SUPREME ACCURACY

STANDARD DIAL INDICATOR



Available in two sizes of face—2 in. and 2½ in. diam.

THIS advanced type of Dial Gage is made in a Gage making shop, to the finest of gage standards. Unit construction with the fewest number of parts, all enclosed in dust proof cover. Sturdiness that stands hardest shop. Supremely accurate because new method of cutting gears and rack makes this possible. Available in two sizes, 2-in. and 2½-in. in a full range of graduations. Write for booklet.

STANDARD GAGE CO., Inc.

Poughkeepsie, New York

The Standard Gage Co.,
Poughkeepsie, N. Y.

I would be interested in receiving copy of your catalog covering your "STANDARD" Dial Indicator.

Name..... Title.....

Firm .....

Address .....

City..... State.....

the amount of unbalance in actual values and locate the spot for correction accurately. One operator, reading values, can keep two or more others busy making the necessary corrections. The machine is designed with a locking brake which assists in quick operation, and the brake can also be used to hold the part in process while weights are being added in the machine, if this is desired.

To operate, special ball bearings with suitable bushings are placed on the part to be balanced and this assembly is then

Globe Dynamic Balancing Machine.

placed in the machine saddles. The saddles are then locked with a simple movement of a knob and the work is rotated, power being supplied through a reversible electric motor which is plugged into a light socket. First one saddle and then the other is unlocked with the knobs after setting the amplitude indicators and locator stylus to zero. The locator stylus marks the shaft to show the exact point at which to add the weight to correct the balance. The principle upon which this stylus is built is entirely new, having been developed after a great deal of experimental research. The amount of

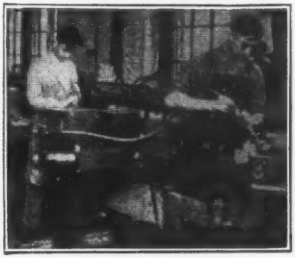
Haskins HS-4 Equipment

HASKINS FLEXIBLE SHAFT EQUIPMENT

—provide an ideal combination — hand-tool flexibility coupled with power.

Haskins saves time and labor, thereby quickening output and increasing profits. Durably built, vibrationless and efficient, they answer the need of every modern machine shop.

We welcome the opportunity of telling you more.



Die Grinding with Haskins HS-4 Equipment

Write for descriptive catalog on the entire Haskins Line.

Write for circular "HASKINS Equipment for the Machine Shop."

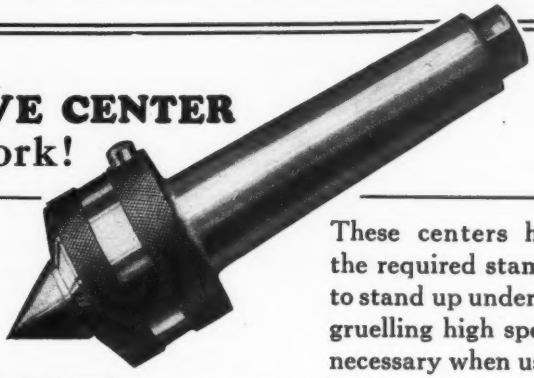
R.G. HASKINS COMPANY

Portable Flexible Shaft Machinery

4653 W. FULTON STREET, CHICAGO, ILL.

Branch Offices in Principal Cities

There Is a NIELSEN LIVE CENTER For Your Work!



No matter what kind of work you have—turning or grinding—high or low speeds—light or heavy loads—a NIELSEN LIVE CENTER will give you years of dependable service.

These centers have the required stamina to stand up under the gruelling high speeds necessary when using tungsten carbide tools.

It will pay you to investigate the NIELSEN CENTER.

Write for a Bulletin!

NIELSEN, INC., LAWTON, MICHIGAN

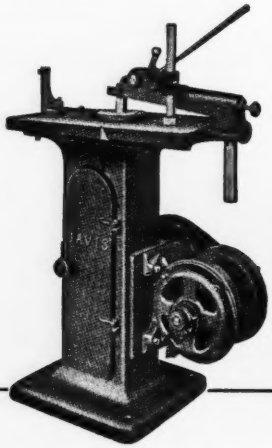
Foreign Representative: Gaston E. Marbaix, Ltd., Adelaide House, King William St., London, E.C.4

QUICK SET-UP does it . . .

A KEYSEATING JOB completed . . . another job to be run . . . **two minutes** to change the set-up . . . and the machine is back on productive work! That's the story of the DAVIS Keyseater.

You need such a quick set-up to cut idle machine hours in your plant. It's the non-productive time between jobs that runs up operating costs.

Let us show you how the DAVIS Keyseater reduces this wasted time to only two minutes . . . **send the coupon TODAY!**



DAVIS KEYSEATER CO.,
250 Mill St., Rochester, N. Y.

How will the Davis Keyseater reduce idle machine hours in my plant?

Name..... Title.....

Address .....

City .....

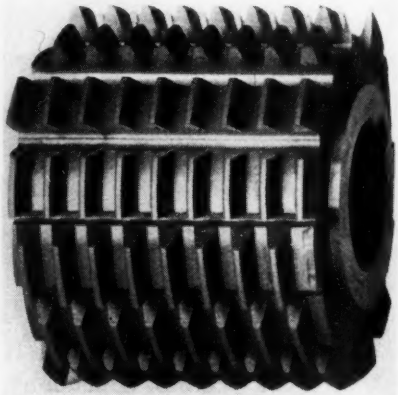
State .....

unbalance is read on the indicators, the operator reading from a chart the amount of weight to add or remove at the point indicated by the machine. It is said that a skilled operator can make this reading in 30 seconds.

The machine will read and locate values as low as five grains, although this amount is much less than is necessary for correction in the average product and is usually necessary only when the parts are to revolve at high speeds or in laboratory work. The machine is built in two sizes, No. 0 and No. 1. The No. 0 size is for use in balancing work with shafts of 2 in. diameter or less, and the No. 1 size is for use in balancing parts with shafts from 2 to 7 in. in diameter and up to 30 inches between bearings. The shaft extensions may be 4 ft. overall.

Barber-Colman High Production Hob

As the result of a considerable amount of research work and experimentation, the Barber-Colman Company, Rockford, Ill., has brought out a hob that differs radically in design from the usual type of hob. The hob, called the High



Barber-Colman High Production Hob.

Production Hob, has teeth that are unusually wide at the tips and are, therefore, much stronger. Another departure from conventional design consists in giving the leading side less clearance and the leaving side more clearance than is ordinarily used, this design being intend-

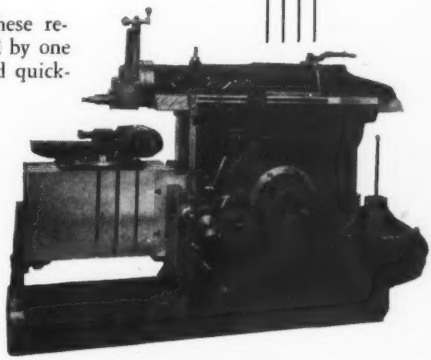
IT'S RESULTS *that count....*

Columbia SUPERIOR

. . . . and the COLUMBIA "Superior" SHAPER gives you good results . . . results that will increase your production.

Some of the many features which insure these results are centralized control, cross rail locked by one lever, longer stroke on angular cuts, patented quick-change feed, and many others. *Durability* is also an important feature.

Let us tell you the whole story of the COLUMBIA "Superior" Shaper and the results you will get. Write for bulletin 17.

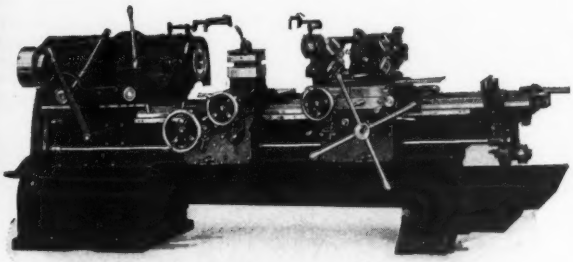


THE COLUMBIA MACHINE TOOL CO.

HAMILTON -:- -:- OHIO

No. 3 Acme Heavy Type Universal Turret Lathe with DUO CONTROL

Higher operating efficiency, together with simplified design, makes this Acme Turret Lathe an unequalled producer on all work within range.



DUO CONTROL Turret Lathes Built in These Sizes

No. 1 — Semi- and Full Universal, 2½" capacity.

No. 2 — Semi- and Full Universal, 3¼" capacity.

No. 3 — Semi- and Full Universal, 3½" spindle capacity.

17" and 4½" Semi- and Full Universal, 4½" spindle capacity.

THE ACME MACHINE TOOL CO., Cincinnati, Ohio

ed to produce a more uniform cutting action than has been possible heretofore.

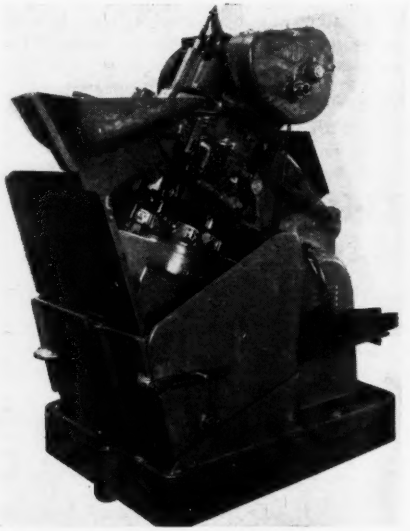
To increase the smoothness of cutting action still further, two more unorthodox changes were made. First, straight gashes are used, producing teeth that have faces at an angle with the line of the lead helix, thus giving a shearing effect on the leading edge and top of each tooth. It is said that the added clearance mentioned above improves the cutting action of the obtuse-angled leaving edge. Second, the teeth are sharpened with a considerable hook instead of with the customary radial face. It is stated that these distortions have the same effect in a hob as a dropoff back of the cutting edge has on any metal-cutting tool—they produce a more effortless cutting action and thus result in better finish. The two foregoing irregularities required that one more distortion be made; the outline of the hob tooth was disturbed by the hook and straight gashes so that it was necessary to make a compensating distortion in the tooth form. It is said that tests have shown that the new hob makes possible an appreciable increase in production with an appreciable decrease in power consumed.

Landis 1-In. Automatic Forming and Threading Machine

A 1-in. automatic forming and threading machine has been developed by the Landis Machine Company, Waynesboro, Pa., to meet the demands of bolt manufacturers who require an automatic machine for threading bolts and screws to 1 in. in diameter. The capacity of the new machine ranges from ½-in. to 1-in. in diameter and it will handle bolts and screws up to 6 in. in length, any length of thread up to 2½-in. and any style of point—cupped, flat, round, dog-point or full cone.

In appearance the machine is similar to the present ¾-in. unit. Many new features have been incorporated, however, to make it a faster, safer and more accurate machine. Features of the machine insure a full thread at the start, an accurate lead, and a minimum amount of taper. This machine employs a special 1⅛-in. "Lanra" head of the pull-off type, equipped with Landis long life chasers. The machine is hopper fed, bolt or screw blanks being dumped or shoveled by hand into the hopper. They are then delivered through a magazine to fingers which transfer them to the turret chuck.

A generous use of heat-treated alloy steel is found in the construction of the turret chuck, making it stronger and lighter and increasing the indexing speed considerably. The time element for the return of the forming and threading head and the indexing of the turret chuck is constant, regardless of the diameter, pitch, length of thread, quality of material or threading speed. The instant that the forming and threading operations are completed, an automatic accelerated motion, entirely



Landis 1-In. Automatic Forming and Threading Machine

independent of the cutting speeds, withdraws the forming and threading spindles and indexes the turret. By the use of a new chucking arrangement the chucking and indexing time is decreased considerably, greatly increasing the production.

Similar to the turret chuck on the ¾-in unit, the chuck has three stations, one of which is used for unloading and loading work, one for cutting to length and forming the end of the screws, and one for threading. These operations are performed simultaneously. An ejector at the unloading and loading station removes the bolt in case it fails to drop from the grip.

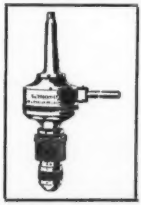
A special gripping arrangement has been developed, which, by the use of an adapter, permits the grips common

STOP RIGHT HERE!

"PROCUNIER"
Tapping Attachments

can be used on any old drill press for the most exacting tapping jobs, blind or through.

Try One For 15 Days



We'll guarantee perfectly tapped holes, too! And here's all they cost complete with Morse Taper shank and new style friction chuck.

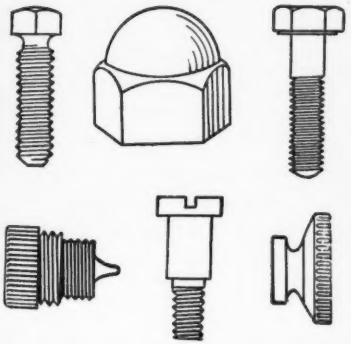
No. 1—7/32" in steel	$28.00
No. 2—7/16" in steel	34.00
No. 3—5/8" in steel	40.00
No. 4—7/8" in steel	52.00

PROCUNIER SAFETY CHUCK CO., 12 So. Clinton St., Chicago, Ill.

Western Screw-Products Co.

Screw Machine Products
Hex. Head Cap Screws

SET SCREWS CASTLE NUTS



1931 St. George St., St. Louis, U.S.A.

Columbia TOOL STEEL

CLARITE HIGH SPEED STEEL
OILDIE NON-SHRINKING
COLUMBIA SPECIAL CARBON TOOL STEEL
COLUMBIA EXTRA, ETC.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
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550 E. 14TH STREET, CHICAGO HEIGHTS, ILLINOIS

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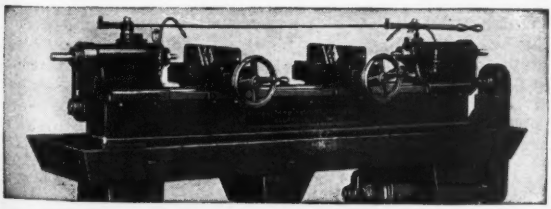
CINCINNATI KANSAS CITY NEWARK SAN FRANCISCO
CLEVELAND LOS ANGELES PORTLAND SEATTLE
DENVER MILWAUKEE ST. LOUIS WORCESTER



Sundstrand

Double End Centering Machine

For centering both ends of a shaft simultaneously. Spindles operate together or independently. L. H. head is removable for long shafts. Accommodates a wide variety of work. Special fixtures furnished when desired. Send for Bulletin.

SUNDSTRAND MACHINE TOOL CO. **Rockford, Illinois**

to the ¾-in. unit to be adapted for the 1-in. machine. An improved line of sockets and grips that handles practically every type of bolt and screw used today has been developed for use on this new machine. Short bolts threaded up close to the head can be handled. Square head bolts that vary in head size and that require a thread close to the head are handled by a unique bolt guide attachment. This attachment gives the bolt a 90-degree turn, permitting the bolt to be gripped across the corners. This method maintains a concentric thread form when there is a large variation in sizes on this type of bolt heads. Oval neck bolts, guy clamp bolts, chuck bolts, fillister head, carriage bolts, etc., are all handled in a satisfactory manner by the new set of sockets and grips. Included in the set are also a complete line of grips for all types of aviation bolts and screws where the threads have to be concentric with the body and where the limits are close.

The feature of opening and closing the chuck on a pivot that is parallel to the bolt, insuring thread concentricity regardless of variations in size, has proven very satisfactory on the ¾-in. machine and it has been retained on the new 1-in. unit.

The threading head—a 1⅛-in. Lanra—is a new development, designed expressly for use on this machine. It is made of a high-grade carbon steel, heat-treated throughout and ground and it is an accurate, long wearing head. It is centrally located in the front of the machine, and is screwed to the nose of the spindle. It may be quickly removed without dismounting the yoke. More effective safety devices have been employed, one of importance being a device for closing the threading head in case a screw is accidentally twisted off in the head.

A forming head of new design, threaded for easy attachment and removal to the spindle nose is also used. This forming unit is a steel head and it is attached to a special new type of alloy steel bushing that will outwear three or more bushings made of a high grade of tool steel. Change gears of pick-off type permit changes in the speed of the forming and threading head to be made in about two minutes. A speed of from 20 to 50 ft. per minute can be obtained for any diameter.

Standard equipment on this machine is an oscillating conveyor that can be arranged for delivering the bolt at either the front or rear of the machine. Other methods of delivering the finished work are provided to suit individual handling methods and plant conditions. The machine is furnished for either belt or motor drive.

New General Electric Catalog

General Electric catalog GEA-600A, superceding all previous catalogs issued by the company with the exception of those dealing with railway, mine and industrial supplies and merchandise products, has been issued. The publication is issued every two years. The book, two inches thick, contains 1146 pages, 8 by 10½ inches, and is profusely illustrated.

The catalog is thumb-indexed in 16 sections as follows: Generation, wire and cable, distribution transformers, arresters and capacitors, voltage regulators, switching equipment, switchgear, meters and instruments, lighting equipment, motors, motor applications, industrial control, transportation, industrial heating, miscellaneous, and indexes. In the indexes, products are classified both by subjects and by catalog numbers.

Many New Items in Latest "U. S." Catalog

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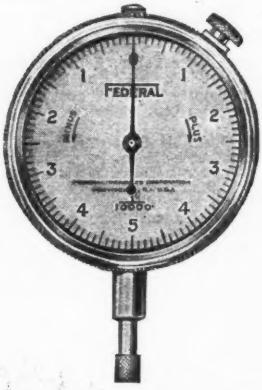

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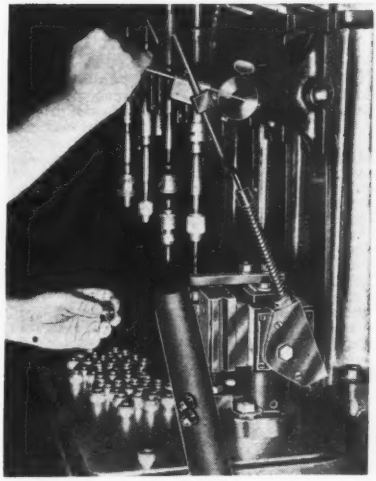

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Ames Dial Gages: The latest types of dial gages for inspection purposes are described in the Ames No. 55 Bulletin, which will be sent free to any machine shop executive. Address B. C. Ames Co., Waltham, Mass.

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Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

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All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

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How To Sharpen Staggered Tooth Cutters, Helical Milling Cutters, and Two-Lipped End Mills: A series of pamphlets on these subjects can be obtained without charge by addressing the Brown & Sharpe Mfg. Co., Providence, R. I.

Sheet Metal Problems: The use of the nibbling machine for cutting sheet metal stock is discussed in a booklet which can be had without charge by addressing Andrew C. Campbell, Inc., Bridgeport, Conn.

High Speed Drill Presses: A complete line of drill presses that can be run at high speeds with complete safety is described in catalog number 50, issued by the Canedy-Otto Manufacturing Company, Chicago Heights, Ill. This catalog also contains descriptions of other equipment manufactured by this concern. Sent free upon request.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various types and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

Grinding the Centerless Way: The advantages of the centerless grinding method is discussed in a booklet which also describes the centerless grinding machines made by Cincinnati Grinders, Inc., Cincinnati, Ohio. The illustrations show various types of jobs in process, and full data is included. Copy free upon request.

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Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High-Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Grooved Cast Iron Pulleys: All sizes of grooved cast iron pulleys, made by Efficient Machine Shop, 147 Baxter St., New York City, are listed in a circular that can be had by writing this firm.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

"The Practical Art of Generating": A simple and practical analysis of the generating principle, showing how teeth are generated on all kinds of gears, is included in a book that has been issued by The Fellows Gear Shaper Co., Springfield, Vt. Copy free upon request.

Questions To Ask Before Buying a Jig-Boring Machine: A list of the fine points to look for in a jig-boring machine, with descriptions and illustrations of the working parts of the Swiss Jig Borer, can be obtained free by addressing The R. Y. Ferner Co., 1511 K St., N. W., Washington, D. C.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Gear Problems: Catalog No. 203, published by the Foote Bros. Gear & Machine Company, Dept. 68, 111 No. Canal St., Chicago, Ill, is intended to serve as a complete reference work for all users of gears or speed reducers. Full instructions for figuring gears, sprockets, chains, etc. are included. Copy free to any mechanical executive.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Gallmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

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Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

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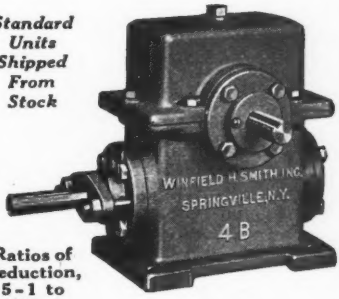

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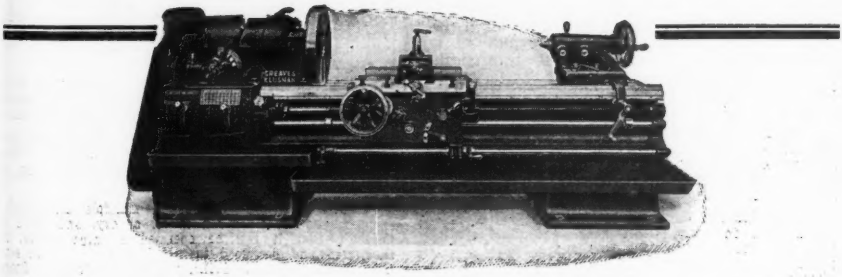

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Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Punching and Shearing Machines of the most modern design are described and illustrated in a series of bulletins that can be obtained without charge by addressing The Long & Allstatter Co., Hamilton, Ohio.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

"A Captain of Industry:" Pocket Handbook 23-P, issued by The David Maydole Hammer Co., Norwich, N. Y., tells how David Maydole came to make what he considered the best hammer in the world, and also includes descriptions of the various types of Maydole hammers. Several useful tables are included. Copy free upon request.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

Midwest Pin Drive Keyway Cutters are described and illustrated in a catalog that can be had by addressing Midwest Tool & Mfg. Co., 2362 West Jefferson Ave., Detroit, Michigan.

Polish at Any Speed: The Mitchell motor-driven polishing lathe, in which herringbone gears are used to transmit power from the motor shaft to the lathe spindle, can be operated at any desired speed. Bulletin can be obtained by addressing the Mitchell Engineering Co., Springfield, Ohio.

Natco Drilling, Tapping, and Boring Equipment is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Natco" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

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Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

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Powell "Blo-Gun" Air Valves: Air is faster and more efficient than a brush for cleaning machine tables. The use of the Powell Blo-Gun for this purpose is discussed in a catalog that can be obtained by addressing The Wm. Powell Co., Cincinnati, O.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Procunier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Procunier tools play in obtaining greater accuracy and less tap breakage.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Rahn-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Fullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Hy-Draulic Shaper-Planer: The most modern features are embodied in the design of the Rockford Hy-Draulic Shaper-Planer, which is intended for work that would otherwise go to the small planer or large shaper. Write for folder to Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill.

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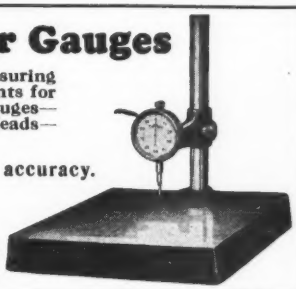

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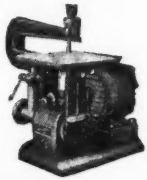

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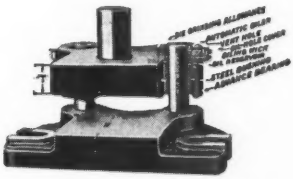

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Safety Grinding Wheels: The complete line of grinding wheels made by the Safety Grinding Wheel & Machine Co., Springfield, Ohio, is described in Catalog No. 11, which is issued by this firm. The book also contains instructions for operating grinding wheels, tables of grinding wheel speeds, pulley calculations, and other information for the user of grinding wheels.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-'Em-Up" drill sleeve, "Wear-ever" chucks, collets, cutters, reamers and tap holders, counterbores, spotfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

Equipment For the Shop: Vises for the bench, drill press, milling machine or shaper; angle plates; adjustable clamps, jacks and other tools for the machine shop, are described and illustrated in a booklet that is published by the Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill. Copy free upon request.

Economies in Material Handling: A volume of facts about planned load handling, with actual examples of economies in time, material, and labor costs that have been effected with Shepard electric hoists will be sent free upon request to Shepard Niles Crane & Hoist Corp., 424 Schuyler Ave., Montour Falls, N. Y.

Rapid Drill Jigs: How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Slewek Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

"Metal Cutting" is the title of the book that describes the latest methods of cutting metals, and includes descriptions and illustrations of both the band saws and inserted-tooth metal-cutting saws made by the Simonds Saws & Steel Co., Fitchburg, Mass. Copy will be sent free upon application to the firm mentioned.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WHS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

Shaping with Modern Equipment: The Smith & Mills Company, 2889-91 Spring Grove Avenue, Cincinnati, Ohio, has issued a booklet which describes and illustrates the line of modern shaping equipment made by this firm. Copy free upon request.

Accurate Gages Speed Production: The complete line of snap, plug, ring, pin, dial indicator, and special gages made by the Standard Gage Co., Inc., Poughkeepsie, N. Y., is described and illustrated in Catalog No. 4, which can be had without charge by addressing this firm. Johansson gage block sets and accessories are also listed in this book.

Machinists' Tools and Gages: Catalog No. 24, issued by the L. S. Starrett Co., Athol, Mass., describes and illustrates the complete assortment of machinists' fine tools and gages made by this firm. Copy free upon request.

Flexible Shaft Equipment: The uses of the flexible shaft for drilling, grinding, and other operations is discussed in a booklet which also describes and illustrates the flexible shaft equipment made by N. A. Strand & Co., 5001 N. Lincoln St., Chicago, Ill.

Cutting Oil Data: A series of booklets containing valuable information about cutting oils and their uses for thread-cutting, broaching, and general cutting purposes will be sent free to any mechanical executive by D. A. Stuart & Co., 2727 South Troy St., Chicago, Illinois.

Rigidmilling Principles and Practice: A book that shows how the Rigidmil can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Precision Measuring Instruments: The gages, micrometers, and other precision measuring instruments made by the Swedish Gage Co. of America, 7310 Woodward Ave., Detroit, Mich., are fully described in an interesting booklet that has been published by this firm. Copy free upon request.

Snap, Plug, Ring, and Thread Gages: The complete line of precision gages made by The Taft-Peirce Manufacturing Co., 32 Mechanic Ave., Woonsocket, R. I., is described in a folder which can be obtained, free, by addressing this company.

Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

A Simplified and Improved Drive Control for Machinery: Two distinct types of plate clutches that have proved successful highly in the driving mechanism of machine tools are described and illustrated in a bulletin that will be sent free by the Twin Disc Clutch Company, Racine, Wis.

Powerful, Easy-Acting Chain Hoists of the most modern design are described and illustrated in a booklet that is issued by the Union Manufacturing Co., 296 Church St., New Britain, Conn. Copy free upon request.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Accuracy In Thread Production: How accurate threads can be produced by the thread miller is told in a pamphlet that can be obtained free by addressing the Waltham Machine Works, Box 296, Waltham, Mass.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Ask for it.

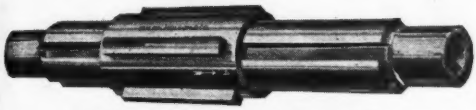
Screw Machine Products: Full information as to the manufacturing service on screw machine products maintained by Western Screw Products Co., 19-31 St. George St., St. Louis, Mo., will be sent upon request.

Wetmore Adjustable Reamers: The exclusive features of the Wetmore Adjustable Shell Reamer are discussed in Catalog No. 29, issued by the Wetmore Reamer Co., 62 27th St., Milwaukee, Wis. Copy free upon request.

Whiton Steel Body Lathe Chucks: The various types and sizes of steel body chucks for lathes that are made by the D. E. Whiton Machine Co., New London, Conn., are described and illustrated in a booklet that will be sent free upon application to this firm.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

"An Inspection Tour of Industrial Plants" is a booklet published by Wilson-Maeulen Co., Inc., Concord Ave. & 143rd St., New York, N. Y., showing the heat-treating equipment in use in a number of industrial plants, and discussing the manner in which such equipment is automatically controlled. Copy free upon request.



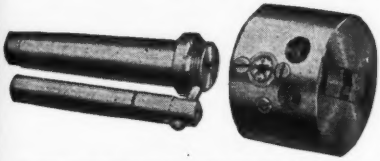
Nicholson Expanding Mandrels

TURNING a solid mandrel up for every job is nearly as bad shop practice these days, as making a solid reamer for every job instead of using an expansion reamer.

Write us about Expanding Mandrels

W. H. Nicholson & Co., 136 Oregon St., Wilkes-Barre, Pa.

FLYNN MICROMETER OFFSET BORING HEADS



FOR ECONOMY IN PRECISION BORING

The least overhang of any head on the market, yielding utmost rigidity and maximum table travel. Made in a full range of sizes to fit all standard spindles and arbors.

Send for Circular and Price List

WATERSTON'S

420 Woodward Ave. Detroit, Mich.

Drill Around Corners

WITH A

Koza Right Angle Drill

WHEN it is necessary to put in a hole or drill out a broken bolt in a hard-to-get-at-place — a Koza Right Angle Drill or Grinder will prove itself worth its weight in gold.

Koza Right Angle Drills and Grinders eliminate the necessity of tearing down a machine, to reach the broken bolt or part, by drilling around the corner — at right angles.

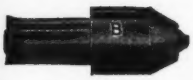
These tools may be used for drilling, keywaying or countersinking. There is a tool for every requirement—in every industry.

Write for Bulletin

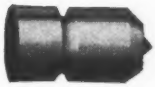
CHAS. A. KOZA

464 AUGUSTINE STREET
ROCHESTER, N. Y.

FOR PRECISION GRINDING . . .



Landis Nib

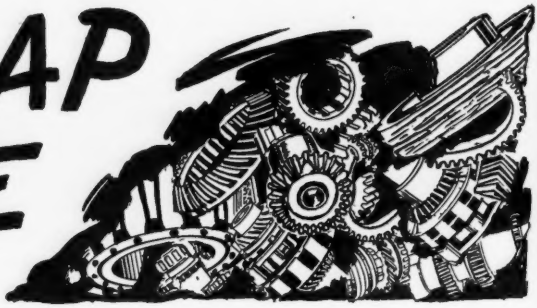


Norton Nib

. . . keep your grinding wheels smooth and true with a Desmond Diamond Dresser. The illustrations show a hand tool and diamond nibs for a Landis and Norton Grinder. We also mount diamonds in any special holder that may be required. Send for Catalog M.

THE DESMOND-STEPHAN MFG. CO., Urbana, Ohio

THE SCRAP PILE



By GEO. ALEXANDER MANN

If you'd be there with push and pull
—take up the slide trombone.

Mayme Sez

It was the saddest movie
I've e'er seen in my life—
Gosh, when his poor sweetie died,
He went back to his wife.

Some folks don't believe anything they hear—not even their conscience.

Sobby But Troo

Early to bed,
An' early to rise,
An' you won't know nothin'
You'll havta surmise.

Some men are 'bout as true to their country as they are to their wives, which o' course is a fine thing fer the country.

Aw Shuddup

A guy told me the other day that he was an Eagle, an Elk and a Moose, an' I knew all the time that he was a lion.

Poor Sap

"We've a new church altar,"
He said to Miss Jewett,
She jumped up mos' joyous,
An' cried, "lead me to it."

Uncle Dud ejaculates that wimmin choosing furs to suit their personalities has ruined the cat crop.

That's Mary

What kind o' pie
You order from Mary,
Don't make no diff,
You get the raspberry.

The loon may be a funny bird, but it takes the stork to kid us along.

Troo Enuff

"One thing is a fact,
I can prove it," sez Mose,
"A sock on the foot
Is worth two on the nose."

We're all broadminded when it don't cost us much.

In Chicago only those killed by bullets are reported to have died natural deaths.

Bout the Size Uv Ut

The new small auto
Is so small, dawg gawn,
Yuh can't get in ut,
Yuh gotta put it on.

The trouble with lotsa men these days is too much bone in the head an' none in the back.

Little Izzy is a funny
And eccentric sort of waif;
Swallowed all his sister's money,
Said that he was playing safe.

As a
SHAPER
—or—
As a
SLOTTER

USED either way, you can't beat the RHODES "Convertible" Shaper and Slotter when it comes to accuracy, speed and economy!

This tool provides an ideal means of handling a wide range of work ordinarily assigned to larger machines. Easily and quickly changed from one tool to the other it is a space saver in any shop. Send for a Bulletin.

THE RHODES MFG. CO.
WALTHAM MASS.

BROACH *for*
Accuracy—Economy!

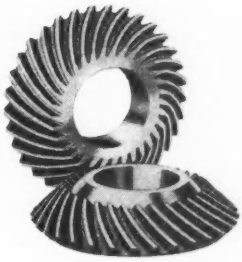
Let us show you how to finish more holes—more accurately—and at less cost.

The American 2-Ton Hydraulic Press

is recommended for broaching connecting rods and work that comes within the 2-ton range. We manufacture presses from 2 tons to 150 tons pressure, also all types of broaching tools.

AMERICAN BROACH & MACHINE CO.
ANN ARBOR, MICHIGAN

Ask the User of



CINCINNATI GEARS...

He'll tell you how accurately they are cut—how smoothly they are finished—and how rigidly they meet the strictest requirements!

And when you try them, you'll find that

CINCINNATI GEARS
Are Good Gears!

Write For a Catalog

The Cincinnati Gear Co
1825 READING ROAD
CINCINNATI OHIO

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A good one for your Driller, Miller, Shaper or Planer

VISE

Jaws 6", 9" and 12" Long
V-Jaws, extra, for All

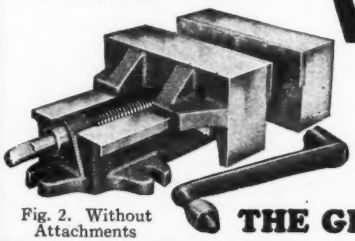

Fig. 2. Without Attachments

With and Without Jig Attachments

Any vise will pay. More time is consumed in catching work than drilling it.

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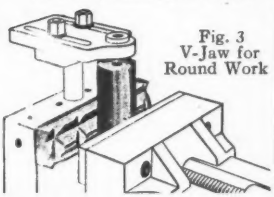


Fig. 3 V-Jaw for Round Work

THE GRAHAM MFG. CO., 69 Willard Ave. Providence, R.I.

Boiler Clamps

Electric Steel
Deep Throat,
Medium
Weight.

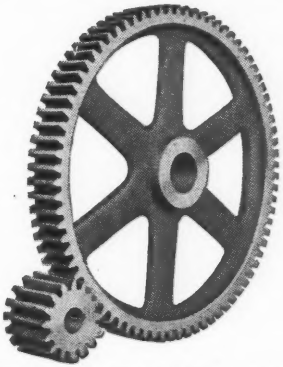
Made in three sizes

Opening from 2½ to 6 inches

Send for catalogue No. 80, showing other types and Lathe Dogs and Expanding Mandrels, etc.

W. G. LECOUNT TOOL WORKS
SOUTH NORWALK, CONN.

GEARS



All types and sizes up to 12 ft. in diameter. Rush service for breakdowns. Also a complete line of speed reducers.

The Horsburgh & Scott Co.
5110 Hamilton Ave. Cleveland, Ohio

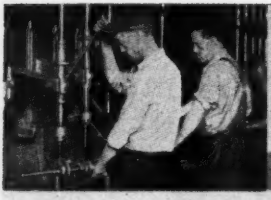
This ANDERSON HAND SCRAPER

***will be sent to you for* 10 DAYS' FREE TRIAL!**

Don't waste time making your own. The blades are of just the right hardness. Cuts faster and lasts longer than any home-made scraper.

Price per doz., ¾", $26.00; 1", $27.00; 1¼", $28.00. *Let us send you one on trial.*

ANDERSON BROS. MFG. CO. 1926 Kishwaukee St., Rockford, Ill.



. . . . NOW YOU CAN SPECIFY REAMERS FROM KNOWN COSTS . . PROVED ON YOUR OWN MACHINES

For the past few months we have recommended the cost-per-hole test to reamer users, as the only sound and practical way of selecting the best reamer for the job. Big savings in cost, discovered in such tests have been published in Cleveland Twist Drill advertising and described in detail by the Company's salesmen.

Hundreds of purchasing agents and engineers have written for details . . . asking how this test could be made in their own plant. So great has been the interest that we have decided to make the method available to all users of reamers and drills. We asked a well known firm of investigating engineers to draw up a series of simple forms which could be used in recording facts and figures necessary in making the test. From this information, the *cost-per-hole* reamed can be quickly calculated. You can compare Peerless Reamers (or Cle-Forge Drills) with any other make . . . on any job in your shop . . . and with no interruption in regular production. The *cost-per-hole* test is simple—the results positive and conclusive.

Complete test forms are now ready for distribution. They will be mailed free of charge and without obligation to purchasing agents and production executives who request them.

The coupon is for your convenience. Clip it and mail it today.

A midwest machine works is now saving $904 per year on its reamer purchases as a result of economies brought out in the cost-per-hole *test. The shop formerly used 1000 ordinary straight fluted reamers in a year—averaging 100 holes per reamer. When Spirex Taper Pin Reamers were tested on the same operations, the average jumped to 2000 holes per reamer. Only 50 Spirex Reamers are needed now to fill a year's requirements. And increased reaming speed made possible by Spirex has permitted a reduction in piece rate of $318 per year. Total saving $1222. Digest No. 75 gives complete details of this test.*

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☐ Without obligation you may send us complete forms for making the cost-per-hole test with Spirex Taper Pin Reamers ☐ or Peerless High Speed Reamers ☐ or Cle-Forge High Speed Drills ☐ (specify which).

☐ Send Digest No. 75 too.

Name .....

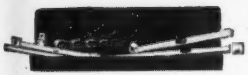
Company Name .....

Address .....

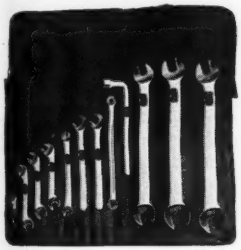
"Makes adjusting tappets a cinch"

TAPPET WRENCH SET No. 22—Will take care of tappet adjustment on majority of cars and trucks. Consists of 2 each of 3 different size wrenches with openings of ½", 9/16", 5/8", 11/16", ¾" and ⅞".
Price - $7.45

BONNEY CV *Chrome-Vanadium* WRENCHES



DOUBLE HEXAGON SOCKET SET No. 7D--Contains 5 double hexagon sockets 3-8 in. to 5-8 in. inclusive--an offset handle, universal joint, 12 in. T handle, and 6 in. extension.
Price - - - - $8.30

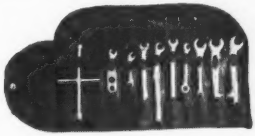


BRAKE ADJUSTING WRENCH SET No. 37--Consists of 12 wrenches which will service the brake adjustment of a large number of makes of cars and trucks.
Price - - - - $26.00

BY the use of Chrome Vanadium, it is possible to make Bonney *CV Wrenches lighter, better balanced and with unbreakable strength. The tremendous strength allows refinement of design both in shape and thickness of head. The thin pointed jaws make the wrenches more serviceable for work in close quarters.

Bonney *CV Chrome Vanadium Wrenches are guaranteed not to break or spread and any wrench will be replaced free of charge, that does not stand up to this guarantee.

DOUBLE END BOX WRENCH SET No. 33--For work in close quarters. An assortment of 9 long wrenches (one end offset) having same openings in both ends, sizes from 7-16 in. to 15-16 in.
Price - - - - $21.00



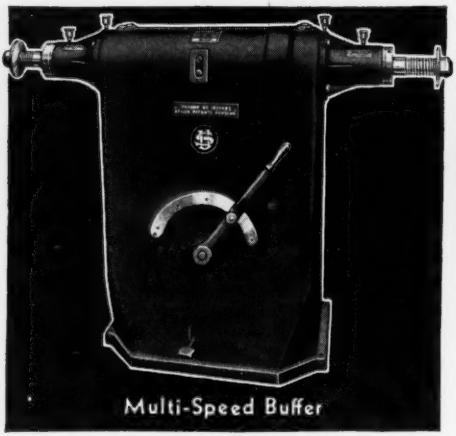
IGNITION WRENCH SET No. 18--Consists of 10 wrenches for use on such electrical systems as Auto-Lite, Bosch, Delco, Eisemann, North East, Remy, Splitdorf, Westinghouse, etc.
Price - $5.80

CV is a Bonney trademark registered in the U. S. Patent Office
Patents Pending

BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA.
Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Pipe Wrenches, and Drop Forgings

Chrome Vanadium registered August 11, 1925

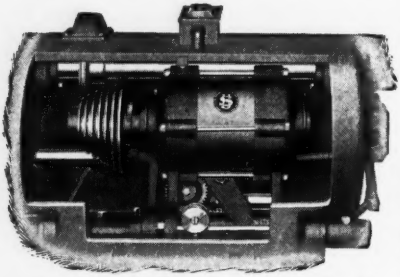
FOUR
Buffing Speeds!


Multi-Speed Buffer

UNUSUAL interest is being created everywhere by the U. S. Multispeed Buffer. Is it any wonder?

It provides four different wheel speeds from 2,000 to 3,000 r.p.m.—giving just the right burnishing or buffing speed for practically any job. And changing from one speed to another is done by simply using hand lever and foot pedal shown.

It operates on alternating current. It embodies the famous Gibbs V-Disc Transmission of GRAPHITIZED MICARTA—a feature found only in this make of buffer because it's patented. This drive shows highest efficiency in power transmission. It is positive in action, without slip or back lash. It is quiet, durable, easily accessible, low in replacement cost, and economical. It's dependable, too—built to withstand long, hard usage.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